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June 24, 2020

Mr. Kenan Cetin
West Virginia Department of Environmental Protection
Division of Water and Waste Management
131A Peninsula Street
Wheeling, WV 26003

Subject: 2019 Operation, Maintenance, and Monitoring Activities Memorandum
Union Carbide Corporation Institute Facility, Institute, West Virginia
(Permit ID# WVD005005509)

Dear Mr. Cetin,

Enclosed for review is the 2019 Operation, Maintenance, and Monitoring Activities Memorandum for the Union Carbide Corporation Institute Facility in Institute, West Virginia. The information presented herein was completed in accordance with the May 2019 Operation, Maintenance, and Monitoring Plan.

If you have any questions or would like to discuss this document further, please contact me at 304-747-7788 or Paul Weber/Jacobs at 317-344-0022.

Sincerely,

Jerome E. Cibrik, P.G.
UCC Remediation Leader

cc: John Hopkins/USEPA
USEPA Region 3 File Repository
Paul Weber/Jacobs

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Memorandum

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Subject	**2019 Operation, Maintenance, and Monitoring Activities Memorandum**
Project Name	Union Carbide Corporation Institute Facility, Institute, West Virginia
From	Jacobs
Date	June 2020

This annual technical memorandum (TM) summarizes operations, maintenance, and monitoring (OMM) activities completed in 2019 for the corrective measures at the Union Carbide Corporation (UCC) Institute Facility (hereafter referred to as the facility) in Institute, West Virginia (Figure 1). The corrective measures for the facility were specified in the Final Decision issued by the U.S. Environmental Protection Agency (USEPA) in October 2018 (USEPA 2018). As prescribed in the Final Decision, a State Corrective Action Permit was issued by the West Virginia Department of Environmental Protection (WVDEP) on February 22, 2019, to require implementation of the final remedy.

Background

Corrective measures at the facility requiring ongoing OMM activities are presented in the *Corrective Measures Implementation Work Plan* (Jacobs 2019a) and are summarized below. Additional site background and historical information is included in the *Corrective Measures Study* (CMS; CH2M 2018a). An overview of areas requiring ongoing OMM activities is provided in Figure 2.

Groundwater Monitoring

Sitewide groundwater monitoring is conducted in accordance with the *Sitewide Groundwater Performance Monitoring Plan* (Jacobs 2019b) and is reported separately in the *2019 Groundwater Performance Monitoring Report* (Jacobs 2020).

SWMU 1

Solid Waste Management Unit (SWMU) 1, former UCAR Carbon Company Landfill, is a closed landfill that has a gravel cover and is crossed by one rail line. Periodically, seeps of a black, tar-like substance surface in the gravel cover of the landfill itself. The tar-like substance most frequently appears during periods of hot weather and results in tar-like deposits on the ground surface (CH2M 2010).

SWMU 2 & 6

SWMUs 2 & 6 (Number [No.] 2 Ash Pond and No. 2 Fly Ash Landfill) are managed together as a closed landfill with a soil cover. The No. 2 Ash Pond was constructed over a portion of the closed No. 2 Fly Ash Landfill. In 2018, the No. 2 Ash Pond was permanently closed by removing the contents to the base of the pond, covering it with 1 foot or more of clean clay, and providing topsoil and a vegetated soil cover to match the existing closed landfill.

WWTU Closed Ponds

The wastewater treatment unit (WWTU) area includes six Resource Conservation and Recovery Act (RCRA)-closed ponds (No. 2 Sludge Pond, Former Biobasin No. 1, Former Biobasin No. 2, Former Biobasin No. 3, Former Equalization Basin, and Former Panic Pond Area) and three non-RCRA closed ponds (No. 1 Sludge Pond, No. 3 Sludge Pond, and the Former Pond) formerly associated with the WWTU. The current WWTU was built over the Former Pond, the Former Equalization Basin, and the western portion of the Former Panic Pond; therefore, the soil covers are not accessible at ground surface because they are beneath concrete and/or infrastructure associated with the WWTU.

SWMU 11

SWMU 11, former Chemfix Landfill, is a closed landfill with a soil cover.

CMS Area A

CMS Area A consists of SWMU 18, SWMU 22, and Area 3 (the former Fluorocarbon Area and associated units). A groundwater remedy consisting of aerobic co-metabolic bioremediation (ACB) via enhanced biosparging (BS) is currently operating at Area 3 to treat the constituents of concern (COCs) in groundwater (carbon tetrachloride, chloroform, tetrachloroethene [PCE], and trichlorofluoromethane [TCFM]).

Tank 1010

The Tank 1010 area, within CMS Area B, includes a technical impracticability zone for contaminated groundwater that was established by USEPA because it is not practical from an engineering perspective to remediate the area.

Institutional Controls

The final remedy includes land and groundwater use restrictions to be implemented at the facility and at the following locations where facility-related COCs have migrated:

- Southwestern portion of West Virginia State University (WVSU)
- Appalachian Power Company (APCO)
- Norfolk Southern (NS) Property

Institutional controls (ICs), discussed in detail in the Corrective Measures Implementation (CMI) Work Plan, fall into four categories: 1. groundwater use restrictions, 2. vapor intrusion (VI) restrictions, 3. subsurface work restrictions, and 4. land use restrictions (e.g., commercial/industrial use).

Landfill Inspections

The final CMI Work Plan was submitted to WVDEP in September 2019; therefore, landfills inspections were only completed for the third and fourth quarters of 2019.

Fence Inspection

Perimeter fencing is in place to restrict access to the main chemical plant and the WWTU. SWMU 1 is also enclosed by perimeter fencing specific to the SWMU to prevent unauthorized access. The SWMU 1 fence includes two gates associated with the rail line to allow railroad access through the SWMU. Gates to the main chemical plant, WWTU, and SWMU 1 are kept locked and warning signs are posted to restrict access.

The perimeter fence associated with the main chemical plant was inspected in 2019 by UCC until the facility was sold to Altivia in late 2019; Altivia completed inspections of the perimeter fence after the sale.

The condition of the SWMU 1 fence, warning signs, and gates was inspected in September and December 2019 by Jacobs and documented on the inspection checklists in Appendix A.

Soil Cover Inspection

The gravel cover over SWMU 1 and the soil covers over SWMU 2&6, SWMU 11, and the closed ponds were inspected in September and December 2019. Inspection activities consist of a walking survey to identify signs of damage to the soil covers (e.g., erosion, furrows, ruts, or animal burrows). Documentation from the inspections is included in Appendix A. The only finding noted was that minor ruts were beginning to form on the western slope of the SWMU 2 & 6 soil cover during the September inspection; however, by the December inspection, sufficient vegetative cover was established that corrective action was not required.

The Former Pond, Former Equalization Basin, and the western portion of the Former Panic Pond Area are covered by concrete and/or infrastructure associated with the active WWTU. Inspection of these former ponds includes a visual survey to identify any areas in which damage to the concrete or WWTU infrastructure is present and could expose the underlying soil cover or waste material. The inspections were completed in September and December 2019 and documented on the inspection checklists in Appendix A. No damage was observed during the inspections.

Institutional Controls Inspections

Institutional controls will be implemented through the use of environmental covenants which are currently being prepared in accordance with the Uniform Environmental Covenants Act, West Virginia Code Chapter 22, Article 22B. If environmental covenants cannot be implemented for the offsite properties, WVDEP may decide to implement the institutional controls through an enforceable order.

IC inspections were not completed in 2019 at the NS, WVSU, and APCO properties and will not be completed in the future until the environmental covenants are signed by all required parties and recorded and/or access is granted by the respective property owners.

IC inspections were completed in December 2019 for the facility and consist of a combination of driving surveys, walking surveys, and records searches to verify the ICs are being followed. No violations of the ICs were observed. Documentation from the inspection is included in Appendix A.

CMS Area A

The ACB system consists of two complimentary processes: continuous injection of ambient air into the aquifer (BS) and periodic injection of a soy-based biodegradable substrate, SoyGold 5000®, to facilitate ACB of the COCs. Aerobic conditions, maintained by BS, support biodegradation of the highly degradable SoyGold 5000®, and generate enzymes capable of breaking the molecular bonds of the COCs. The system was designed for treating the COCs detected in soil and groundwater within Area 3, which are chloroform, carbon tetrachloride, PCE, and TCFM. Area 3 is divided into Subareas 3A, 3B, 3C, and 3D based on historical operations and the presence of potential source areas. Within each subarea, target treatment zones (TTZs) were developed to refer to the areas in which active remediation would be conducted. The TTZs are shown on Figure 2.

The four subareas encompass a total of 191 biosparge wells, 32 performance monitoring wells, and 40 pressure monitoring points. VI mitigation systems (VIMS) were installed as a precautionary measure at occupied structures in CMS Area A (Building 137 and Building 332) to maintain a negative pressure in the subgrade below the buildings as part of the remedy implementation.

Performance Criterion

The purpose of establishing a performance criterion is to measure the operational effectiveness of the ACB remedy and evaluate whether to modify or optimize the current system, transition to an alternate

remedy, or to shut down the system. The performance criterion for the ACB system is to operate each of the four subareas until mass reduction for total COCs in groundwater becomes asymptotic.

System Operations

Remediation systems in Subareas 3A through 3D were started at different times, following the completion of construction and startup activities. Subareas 3B and 3D started in December 2015, followed by Subarea 3C in October 2016 and Subarea 3A in August 2017. Plant-supplied air has allowed for the ACB system to run almost continuously, with little downtime. The 2019 monthly runtimes for all four subareas are presented in Tables 1 through 4. The ACB systems in all four subareas were operational in 2019; however, each system was shut down at various times to evaluate rebound. Subareas 3A and 3C were shut down to evaluate rebound in December 2019. Subarea 3B, which was partially shut down in February 2017 to evaluate rebound, was shut down fully to evaluate rebound in March 2019. Subarea 3D was partially shut down in February 2017 to evaluate rebound; however, rebound was observed so the system was restarted and SoyGold 5000® was injected in October 2019.

The VIMS in Building 137 and Building 332 were inspected monthly in 2019. The monthly inspection of the VIMS confirmed the systems were operating and did not identify any issues with these systems.

Groundwater Performance Monitoring Field Activities

Groundwater monitoring wells used to monitor the performance of the ACB systems are shown on Figure 2. Well construction information for the groundwater monitoring wells are presented in Table 5.

Water level measurements were collected quarterly from the monitoring wells during the groundwater sampling events (Table 6). The monitoring wells were gauged using a handheld electronic water level meter. As noted in Table 6, water levels could not be collected from some of the monitoring wells because they were not accessible during the groundwater sampling event.

Groundwater samples were collected quarterly from the monitoring wells associated with each subarea. Table 7 presents the water quality parameters measured in the field. Subarea 3D monitoring wells were not sampled in fourth quarter 2019 due to SoyGold 5000® injections. Other monitoring wells not sampled in 2019, as noted on Table 7, were not accessible during the groundwater sampling event. The limited number of monitoring wells that could not be sampled in 2019 did not affect the evaluation of remedial performance for the ACB systems.

The groundwater samples were collected using the low-flow groundwater sampling technique described in the standard operating procedures included in the *Sitewide Groundwater Performance Monitoring Plan* (Jacobs 2019b). Samples were analyzed for volatile organic compounds using USEPA Method 8260C.

Groundwater Sampling Results

The groundwater COC concentrations reported since startup are detailed on Tables 8 through 11 for Subareas 3A through 3D, respectively.

The 2019 groundwater data were validated using the precision, accuracy, representativeness, completeness, and comparability (PARCC) criteria outlined in the *Dow WVO Quality Assurance Project Plan* (CH2M 2018b). The laboratory reports and data validation report for the 2019 data are provided in Appendix B. Overall, data quality is acceptable, and the results may be used in project decisions taking into consideration the potential biases and validation flags applied to the data set.

Performance Evaluation

Trend graphs depicting COC concentrations inside and outside the TTZ for each subarea are presented as Figures 4 through 11. The trend graphs show that COC concentrations inside and outside the TTZ in each subarea demonstrate an overall decrease since the remedial systems were started with few exceptions:

- Two monitoring wells (TW-98B and TW-99A) in Subarea 3B, which was shut down fully to evaluate rebound on March 29, 2019, showed increases in concentrations of TCFM and slight increases in concentration of chloroform through 2019.
- TCFM in one well (TW-101B) located outside the Subarea 3B TTZ was not detected during baseline sampling prior to system startup; however, increased significantly in the next two sampling events after system startup (maximum of 103,000 µg/L in May 2016). TCFM concentrations at TW-101B have fluctuated since May 2016 but have generally decreased over time.
- Carbon tetrachloride and chloroform concentrations in TW-97B (located outside the Subarea 3B TTZ), which had shown a slight increasing trend in 2018, showed a decreasing trend in 2019;
- PCE concentrations in 2019 were relatively stable at wells located inside and outside the Subarea 3C TTZ.
- COC concentrations showed increasing trends in wells located inside the TTZ in Area 3D in 2019.

As discussed in the CMI Work Plan, the Thiessen polygon method (USEPA 1998) was selected to assess and document the total mass of COCs removed from groundwater within each subarea. The Thiessen polygon method is a spatially integrated approach that assumes each area of contamination can be represented by polygons of defined area, depth, and concentration. The polygons (also called Voronoi polygons) are obtained by Delaunay triangulation of the well network constrained by the boundary of each subarea. The distribution of the Thiessen polygons for the ACB systems and the monitoring wells associated with each polygon are shown on Figure 3.

The Thiessen mass plots are presented in Appendix C showing total COC mass reduction over time. In all four subareas, 3A through 3D, the COC mass has been significantly reduced by operation of the ACB systems. Reduction in the total COC mass appeared asymptotic for Subareas 3A, 3B, and 3C; therefore, as discussed above, these systems were shut down to evaluate rebound. At Subarea 3D, the total COC mass appeared to be increasing since the system was partially shutdown in February 2017 so the system was restarted and SoyGold 5000® was injected in October 2019.

Overall, the groundwater monitoring results show that ACB systems have been effective at reducing COC concentrations. Groundwater sampling will continue to be performed on a quarterly basis to evaluate rebound at Subareas 3A through 3C and to monitor the operational effectiveness of the Subarea 3D system.

References

CH2M HILL (CH2M). 2010. *Institute 2008 and 2009 Sevin® Unit, SWMU 1, and SWMUs 2 and 6 Corrective Measures Completion Report, UCC Institute Facility, West Virginia*. May.

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Jacobs. 2020. *2019 Groundwater Performance Monitoring Report.* Union Carbide Corporation Institute Facility. June.

U.S. Environmental Protection Agency (USEPA). 1998. *Monitoring and Assessment of In Situ Biocontainment of Petroleum Contaminated Ground-Water Plumes.* EPA/600/R 98/020. Office of Research and Development, Washington DC. February.

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Tables

Table 1. Runtime Summary for Subarea 3A

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Period	Monthly Runtime	Notes
January-19	100%	
February-19	86%	Shut down for GW sampling
March-19	100%	
April-19	78%	Shut down for GW sampling
May-19	100%	
June-19	100%	
July-19	76%	Shut down for GW sampling
August-19	85%	Shut down for GW sampling
September-19	100%	
October-19	100%	
November-19	100%	
December-19	-	Shut down on 12/2/2019 for rebound study

Notes:

GW = groundwater

Table 2. Runtime Summary for Subarea 3B

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Period	Monthly Runtime	Notes
January-19	100%	
February-19	81%	Shut down for GW sampling
March-19	-	Shut down on 3/29/2019 for rebound study
April-19	-	Shut down for rebound study
May-19	-	Shut down for rebound study
June-19	-	Shut down for rebound study
July-19	-	Shut down for rebound study
August-19	-	Shut down for rebound study
September-19	-	Shut down for rebound study
October-19	-	Shut down for rebound study
November-19	-	Shut down for rebound study
December-19	-	Shut down for rebound study

Notes:

GW = groundwater

Table 3. Runtime Summary for Subarea 3C

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Period	Monthly Runtime	Notes
January-19	100%	
February-19	77%	Shut down for GW sampling
March-19	100%	
April-19	86%	Shut down for GW sampling
May-19	100%	
June-19	100%	
July-19	38%	Shut down for GW sampling and well repair
August-19	76%	Shut down for well repairs
September-19	100%	
October-19	100%	
November-19	100%	
December-19	-	Shut down on 12/2/2019 for rebound study

Notes:

GW = groundwater

Table 4. Runtime Summary for Subarea 3D

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Period	Monthly Runtime	Notes
January-19	100%	
February-19	75%	Shut down for GW sampling
March-19	100%	
April-19	67%	Shut down for GW sampling
May-19	100%	
June-19	100%	
July-19	81%	Shut down for GW sampling
August-19	100%	
September-19	89%	Shut down for SoyGold 5000® injections
October-19	93%	Restarted after SoyGold 5000® injections
November-19	100%	
December-19	100%	

Notes:

GW = groundwater

Table 5. Monitoring Well Construction

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Total Depth at Installation (ft btoc)	Well Diameter (inches)	Screen Length (ft)	Screen Depth (ft bgs)	Screen Slot Size (inches)
Area 3A					
TW-127A	30.0	2	10	20-30	0.01
TW-117A	34.0	2	10	24-34	0.01
TW-116A	30.0	2	10	20-30	0.01
TW-114A	30.0	2	10	20-30	0.01
TW-118A	30.0	2	10	20-30	0.01
TW-120A	33.0	2	10	23-33	0.01
TW-119A	30.0	2	10	20-30	0.01
TW-115A	30.0	2	10	20-30	0.01
Area 3B					
TW-51	30.0	2	2	28-30	0.01
TW-95B	50.0	2	10	40-50	0.01
TW-100B	42.0	2	10	32-42	0.01
TW-97B	45.0	2	10	35-45	0.01
TW-98B	45.0	2	10	35-45	0.01
TW-96B	42.0	2	10	32-42	0.01
TW-101B	43.0	2	10	33-43	0.01
TW-99A	45.0	2	10	35-45	0.01
Area 3C					
TW-124B	45.0	2	10	35-45	0.01
TW-125B	45.0	2	10	35-45	0.01
TW-122B	45.0	2	10	35-45	0.01
TW-126B	45.0	2	10	35-45	0.01
TW-121A	30.0	2	10	20-30	0.01
TW-123B	45.0	2	10	35-45	0.01
Area 3D					
TW-88A	30.0	2	10	20-30	0.01
TW-87A	30.0	2	10	20-30	0.01
TW-86A	30.0	2	10	20-30	0.01
TW-94B	45.0	2	10	35-45	0.01
TW-89A	35.0	2	10	25-35	0.01
TW-90B	45.0	2	10	35-45	0.01
TW-91B	50.0	2	10	40-50	0.01
TW-93B	44.0	2	10	34-44	0.01
TW-92B	50.0	2	10	30-50	0.01

Notes:

ft = feet

ft bgs = feet below ground surface

ft btoc = feet below top of casing

TOC = top of casing

Table 6. Groundwater Elevation

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Date	Total Depth at Installation (ft btoc)	Measured Total Depth (ft btoc)	Depth to GW (ft btoc)	TOC Elevation (ft amsl)	GW Elevation (ft amsl)
Area 3A						
TW-127A	2/14/2019	30.0	31.99	21.98	602.91	580.93
	4/11/2019		32.50	22.11		580.80
	7/24/2019		31.91	21.61		581.30
	12/10/2019		32.48	21.71		581.20
TW-117A	2/14/2019	34.0	33.01	21.89	602.80	580.91
	4/11/2019		33.10	22.14		580.66
	7/24/2019		33.08	21.49		581.31
	12/10/2019		33.02	21.58		581.21
TW-116A	2/14/2019	30.0	33.01	21.85	603.05	581.20
	4/11/2019		32.81	22.29		580.76
	7/25/2019		32.75	21.59		581.46
	12/10/2019		32.75	22.18		581.22
TW-114A	2/13/2019	30.0	29.99	18.71	599.22	580.51
	4/11/2019		29.35	18.23		580.99
	8/2/2019		29.61	16.63		582.59
	12/16/2019		29.35	17.80		581.42
TW-118A	2/5/2019	30.0	NM*	NM*	599.10	NM*
	4/12/2019		29.62	17.97		581.13
	7/24/2019		29.63	17.77		581.33
	12/16/2019		29.55	17.74		581.36
TW-120A	2/14/2019	33.0	32.96	21.50	603.12	581.62
	4/11/2019		32.88	21.59		581.53
	7/24/2019		32.98	21.47		581.65
	12/10/2019		32.94	21.79		581.33
TW-119A	2/13/2019	30.0	29.50	18.55	603.53	584.98
	4/11/2019		29.07	18.16		585.37
	7/25/2019		29.12	17.71		585.82
	12/10/2019		29.09	18.37		585.50
TW-115A	2/14/2019	30.0	33.03	22.25	599.36	577.11
	4/12/2019		32.99	22.25		577.11
	7/25/2019		33.09	21.91		577.45
	12/10/2019		32.98	22.55		577.15
Area 3B						
TW-51	2/12/2019	30.0	29.21	17.51	598.69	581.18
	4/10/2019		29.15	17.95		580.74
	7/23/2019		29.21	16.99		581.70
	12/6/2019		29.21	17.78		580.75

Table 6. Groundwater Elevation

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Date	Total Depth at Installation (ft btoc)	Measured Total Depth (ft btoc)	Depth to GW (ft btoc)	TOC Elevation (ft amsl)	GW Elevation (ft amsl)
TW-95B	2/11/2019	50.0	48.90	16.57	598.88	582.31
	4/9/2019		50.55	16.79		582.09
	7/22/2019		49.98	16.19		582.69
	12/6/2019		49.76	17.73		581.08
TW-100B	2/5/2019	42.0	NM*	NM*	601.52	NM*
	4/10/2019		41.87	19.30		582.22
	7/22/2019		NM*	NM*		NM*
	12/5/2019		49.91	21.50		580.02
TW-97B	2/11/2019	45.0	45.51	17.19	599.71	582.52
	4/10/2019		44.55	17.81		581.90
	7/22/2019		44.64	16.98		582.73
	12/9/2019		44.53	18.28		581.14
TW-98B	2/12/2019	45.0	45.79	17.99	599.77	581.73
	4/9/2019		44.94	17.82		581.95
	7/22/2019		44.90	17.09		582.68
	12/5/2019		44.91	18.74		581.03
TW-96B	2/12/2019	42.0	41.61	18.04	599.66	581.23
	4/10/2019		42.65	18.01		581.65
	7/23/2019		42.39	17.73		581.93
	12/6/2019		41.63	18.71		580.95
TW-101B	2/13/2019	43.0	43.05	18.43	599.37	580.94
	4/10/2019		43.14	18.19		581.18
	7/23/2019		43.18	17.82		581.55
	12/6/2019		43.09	18.73		580.64
TW-99A	2/12/2019	45.0	44.90	17.82	600.19	582.37
	4/9/2019		44.95	17.91		582.28
	7/17/2019		44.79	17.51		582.68
	12/5/2019		44.19	19.14		581.05
Area 3C						
TW-124B	2/5/2019	45.0	48.24	19.88	601.86	581.98
	4/2/2019		48.20	19.30		582.56
	7/11/2019		48.23	19.08		582.78
	12/4/2019		48.13	20.17		581.69
TW-125B	2/5/2019	45.0	44.78	15.98	598.46	582.48
	4/2/2019		44.80	15.86		582.60
	8/2/2019		45.55	16.01		582.45
	12/4/2019		44.83	16.75		581.71

Table 6. Groundwater Elevation

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Date	Total Depth at Installation (ft btoc)	Measured Total Depth (ft btoc)	Depth to GW (ft btoc)	TOC Elevation (ft amsl)	GW Elevation (ft amsl)
TW-122B	2/5/2019	45.0	48.65	19.19	601.64	582.45
	4/2/2019		47.80	19.08		582.56
	7/11/2019		48.29	18.82		582.82
	12/4/2019		47.83	19.91		581.73
TW-126B	2/5/2019	45.0	49.01	19.25	601.80	582.55
	4/4/2019		48.05	19.25		582.55
	7/11/2019		47.98	18.99		582.81
	12/5/2019		47.98	20.15		581.74
TW-121A	2/5/2019	30.0	33.49	19.51	602.01	582.50
	4/4/2019		33.03	19.61		582.40
	7/11/2019		33.01	19.21		582.80
	12/5/2019		32.98	20.38		581.74
TW-123B	2/5/2019	45.0	44.61	15.86	598.40	582.54
	4/4/2019		44.99	15.81		582.59
	7/11/2019		44.64	15.54		582.86
	12/5/2019		44.58	16.76		581.74
Area 3D						
TW-88A	2/7/2019	30.0	30.15	16.11	598.49	582.38
	4/5/2019		29.89	15.84		582.65
	7/15/2019		29.81	14.74		580.75
	12/5/2019		NM*	NM*		NM*
TW-87A	2/8/2019	30.0	30.10	16.28	598.39	582.11
	4/5/2019		30.14	16.10		582.29
	7/15/2019		30.09	15.97		582.42
	12/5/2019		NM*	NM*		NM*
TW-86A	2/8/2019	30.0	33.59	19.35	598.44	579.09
	4/5/2019		33.07	19.19		579.25
	7/16/2019		33.09	19.01		579.43
	12/5/2019		NM*	NM*		NM*
TW-94B	2/7/2019	45.0	43.92	16.33	599.08	582.75
	4/5/2019		43.90	16.45		582.63
	7/16/2019		44.01	16.28		582.80
	12/5/2019		NM*	NM*		NM*
TW-89A	2/5/2019	35.0	NM*	NM*	598.26	NM*
	4/4/2019		NM*	NM*		NM*
	8/2/2019		36.11	17.20		581.06
	12/5/2019		NM*	NM*		NM*
TW-90B	2/8/2019	45.0	45.89	15.85	598.31	552.42
	4/4/2019		NM*	NM*		NM*
	7/17/2019		44.63	15.56		582.75
	12/5/2019		NM*	NM*		NM*

Table 6. Groundwater Elevation

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Date	Total Depth at Installation (ft btoc)	Measured Total Depth (ft btoc)	Depth to GW (ft btoc)	TOC Elevation (ft amsl)	GW Elevation (ft amsl)
TW-91B	2/8/2019	50.0	50.07	15.86	598.19	582.33
	4/9/2019		50.08	15.68		582.51
	7/16/2019		50.13	15.52		582.67
	12/5/2019		NM*	NM*		NM*
TW-93B	2/7/2019	44.0	43.14	16.50	599.01	555.87
	4/9/2019		43.69	16.51		582.50
	7/17/2019		43.65	16.39		582.62
	12/5/2019		NM*	NM*		NM*
TW-92B	2/7/2019	50.0	48.63	15.15	597.49	548.86
	4/9/2019		48.66	14.85		582.64
	7/17/2019		48.59	14.78		582.71
	12/5/2019		NM*	NM*		NM*

Notes:

ft btoc = feet below top of casing

ft amsl = feet above mean sea level

GW = groundwater

NM = not measured

NW = no water

TOC = top of casing

*Not accessible during time of event.

Table 7. Final Groundwater Water Quality Parameters

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
Area 3A								
TW-114A	2/13/2019	18.72	6.14	14.6	0.342	124.7	7.60	1.10
	4/11/2019	18.24	5.78	18.4	0.351	137.7	10.68	1.40
	8/2/2019	16.71	5.78	19.7	0.356	156.2	10.02	8.91
	12/16/2019	17.8	7.53	15.4	0.327	79.9	12.89	79.90
TW-115A	2/14/2019	22.30	5.58	16.9	0.497	103.1	2.78	7.94
	4/12/2019	22.35	5.88	19.1	0.650	133.1	1.91	58.10
	7/25/2019	21.94	5.80	18.4	0.520	187.6	2.2	9.77
	12/10/2019	22.65	6.41	16.5	0.660	124.1	1.38	14.40
TW-116A	2/14/2019	21.91	5.95	17.8	0.473	3.4	0.35	16.30
	4/11/2019	22.26	6.29	19.0	0.530	-86.0	0.09	8.17
	7/25/2019	21.61	5.79	28.9	0.690	-95.3	0.16	10.60
	12/10/2019	22.18	6.96	14.8	1.160	-111.4	0.08	1.91
TW-117A	2/14/2019	21.89	5.50	16.7	0.374	164.5	7.85	6.93
	4/11/2019	22.12	5.80	18.0	0.465	172.0	10.89	3.62
	7/24/2019	21.50	6.29	20.1	0.345	192.3	10.82	1000.00
	12/10/2019	21.90	5.19	13.4	0.384	182.8	9.76	20.20
TW-118A	2/14/2019	NS	NS	NS	NS	NS	NS	NS
	4/12/2019	17.99	4.28	18.9	0.260	286.3	0.95	60.90
	7/24/2019	17.71	4.74	20.9	0.234	423.6	2.65	2.98
	12/16/2019	17.8	5.76	17.4	0.620	175.2	4.44	38.20
TW-119A	2/13/2019	18.60	6.79	16.3	0.660	-27.1	0.94	71.30
	4/11/2019	18.18	6.45	17.9	0.660	6.8	1.06	24.90
	7/25/2019	17.71	6.34	17.8	0.520	61.8	0.21	110.00
	12/10/2019	18.38	6.93	16.5	0.064	68.5	1.2	60.60
TW-120A	2/14/2019	21.62	5.52	17.1	0.379	132.1	7.43	14.10
	4/11/2019	21.99	5.75	19.0	0.424	188.4	8.82	66.20
	7/24/2019	21.56	6.19	19	0.386	271.6	11.26	57.50
	12/10/2019	22.16	5.60	14.4	0.369	200.4	9.36	427.00
TW-127A	2/14/2019	21.85	5.71	14.8	0.248	130.5	6.47	38.60
	4/11/2019	22.13	6.24	18.5	0.336	221.8	8.75	9.24
	7/24/2019	21.62	6.23	23.2	0.333	226.1	8.19	18.70
	12/10/2019	22.17	5.35	17.2	0.376	159.9	9.24	57.80

Table 7. Final Groundwater Water Quality Parameters

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
Area 3B								
TW-51	2/12/2019	17.55	7.09	17.5	0.410	157.9	7.51	156.00
	4/10/2019	17.34	7.13	18.0	0.422	100.6	9.44	74.00
	7/23/2019	17.15	6.79	20.1	0.455	289	8.51	103.00
	12/6/2019	17.82	5.67	18.4	0.434	139.1	5.90	44.40
TW-95B	2/11/2019	16.53	5.23	16.6	0.422	228.1	7.59	6.00
	4/9/2019	16.80	5.47	17.9	0.440	330.9	5.50	112.00
	7/22/2019	16.19	5.10	19.8	0.409	249.9	0.60	33.60
	12/6/2019	17.73	4.59	16.9	0.440	175.3	0.13	6.42
TW-96B	2/12/2019	18.20	3.30	17.7	0.600	314.1	1.69	1.87
	4/10/2019	18.12	2.63	18.5	0.580	352.2	1.10	29.70
	7/23/2019	17.83	3.44	20.7	0.730	316.6	0.61	8.47
	12/6/2019	18.78	3.81	18.2	0.640	318.1	0.41	6.64
TW-97B	2/11/2019	17.21	5.25	15.8	0.315	240.5	0.37	11.80
	4/10/2019	17.80	4.95	17.3	0.095	260.8	0.57	15.20
	7/22/2019	17.02	4.86	19.5	0.300	308.7	0.21	13.80
	12/9/2019	18.29	4.66	16.4	0.370	169.4	0.31	6.64
TW-98B	2/12/2019	18.03	4.69	16.3	0.374	221.7	10.36	6.91
	4/9/2019	17.83	4.83	17.3	0.372	242.4	12.58	4.62
	7/22/2019	17.12	4.79	18.3	1.280	150.3	2.92	6.38
	12/5/2019	18.71	5.34	16.9	0.403	158.4	0.47	5.24
TW-99A	2/11/2019	17.82	3.70	16.2	0.473	342.3	8.55	85.70
	4/9/2019	12.94	4.39	19.1	0.510	470.5	7.22	41.50
	7/17/2019	17.56	3.91	20.1	0.430	345.8	0.38	15.70
	12/5/2019	19.17	5.12	16.5	0.446	178.1	0.32	37.10
TW-100B	2/14/2019	NS	NS	NS	NS	NS	NS	NS
	4/10/2019	20	5.42	17	0.350	215.7	2.71	5.41
	7/22/2019	NS	NS	NS	NS	NS	NS	NS
	12/5/2019	21.34	5.95	16.3	0.239	92.4	0.24	11.70
TW-101B	2/13/2019	18.41	3.64	15.3	0.550	295.0	1.66	19.60
	4/10/2019	18.19	3.59	17.4	0.590	361.6	4.88	7.41
	7/23/2019	17.79	3.48	19.8	0.650	403.2	0.98	22.50
	12/6/2019	18.56	3.62	16.7	0.610	312.9	0.13	8.87

Table 7. Final Groundwater Water Quality Parameters

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
Area 3C								
TW-121A	2/5/2019	19.52	8.10	17.7	0.350	132.1	10.42	246.00
	4/4/2019	19.62	8.46	16.7	0.342	73.2	9.86	65.50
	7/11/2019	19.22	8.23	22.6	0.356	98.7	10.28	79.80
	12/5/2019	20.39	7.8	17.7	0.417	119.1	7.86	7.04
TW-122B	2/5/2019	19.19	9.46	16.0	0.479	57.4	11.50	245.00
	4/2/2019	19.10	9.19	16.9	0.600	-11.7	13.25	226.00
	7/11/2019	18.89	9.31	21.5	0.620	81.3	14.82	227.00
	12/4/2019	19.95	8.86	17.1	0.770	117.5	13.06	166.00
TW-123B	2/5/2019	18.90	10.60	17.7	0.860	52.2	0.47	230.00
	4/4/2019	15.82	10.50	19.3	0.750	-88.0	0.03	356.00
	7/11/2019	15.54	10.45	19.2	0.950	20	0.63	591.00
	12/5/2019	16.78	9.83	17.4	0.740	79.1	0.04	237.00
TW-124B	2/5/2019	19.40	9.70	17.0	0.880	125.9	9.54	280.00
	4/2/2019	19.34	9.50	17.2	1.030	-19.8	10.62	360.00
	7/11/2019	19.06	9.51	20.1	0.710	105.1	8.81	195.00
	12/4/2019	20.19	9.06	16.0	1.160	116.9	12.41	150.00
TW-125B	2/5/2019	15.98	9.40	15.9	1.070	121.3	8.69	340.00
	4/2/2019	15.94	9.39	17.1	1.280	8.9	10.66	250.00
	8/2/2019	16.03	9.24	22.9	1.130	23.9	8.70	1000.00
	12/4/2019	16.77	9.08	16.1	1.160	136.2	10.23	169.00
TW-126B	2/5/2019	19.25	9.70	17.4	0.450	83.1	0.82	36.10
	4/4/2019	19.25	9.83	19.9	0.482	-28.2	0.69	78.80
	7/11/2019	19.00	9.65	20.6	0.560	6.71	1.98	21.30
	12/5/2019	20.17	9.04	17.3	0.492	99.2	3.40	32.90

Table 7. Final Groundwater Water Quality Parameters

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
Area 3D								
TW-86A	2/8/2019	19.35	6.28	15.9	0.120	156.7	7.32	12.80
	4/5/2019	19.19	6.29	16.3	0.210	188.2	9.00	27.20
	7/16/2019	19.05	6.33	19.6	0.177	104.2	7.92	8.66
	12/5/2019	NS	NS	NS	NS	NS	NS	NS
TW-87A	2/8/2019	16.39	7.55	12.6	0.328	189.0	8.46	45.80
	4/5/2019	16.11	6.89	15.6	0.343	172.8	9.92	33.40
	7/15/2019	15.92	6.62	17.8	0.216	112.5	10.24	22.50
	12/5/2019	NS	NS	NS	NS	NS	NS	NS
TW-88A	2/7/2019	16.11	6.89	17.2	0.203	88.3	10.01	17.60
	4/5/2019	15.96	7.20	16.9	0.372	169.3	10.85	22.90
	7/15/2019	15.19	6.23	33.7	0.305	180.8	8.39	94.50
	12/5/2019	NS	NS	NS	NS	NS	NS	NS
TW-89A	2/14/2019	NS	NS	NS	NS	NS	NS	NS
	4/5/2019	NS	NS	NS	NS	NS	NS	NS
	8/2/2019	17.25	4.72	19.6	0.52	97.8	0.25	18.60
	12/5/2019	NS	NS	NS	NS	NS	NS	NS
TW-90B	2/8/2019	15.89	6.58	14.9	0.198	159.6	1.88	106.00
	4/5/2019	NS	NS	NS	NS	NS	NS	NS
	7/17/2019	15.59	4.86	22.9	1.02	150.9	3.23	13.00
	12/5/2019	NS	NS	NS	NS	NS	NS	NS
TW-91B	2/8/2019	15.90	6.62	15.2	0.429	127.2	1.47	1000.00
	4/9/2019	15.65	6.28	17.4	0.510	68.1	2.18	119.00
	7/16/2019	15.54	6.55	19.1	0.57	109.0	2.06	66.60
	12/5/2019	NS	NS	NS	NS	NS	NS	NS
TW-92B	2/7/2019	15.15	6.89	16.7	0.324	99.8	0.52	43.30
	4/9/2019	14.86	6.48	16.7	0.295	69.4	1.54	32.10
	7/17/2019	14.79	6.07	18.3	0.78	99.9	1.81	24.60
	12/5/2019	NS	NS	NS	NS	NS	NS	NS
TW-93B	2/7/2019	16.51	6.39	17.5	0.259	132.8	3.45	181.00
	4/9/2019	16.52	6.99	17.2	0.279	217.2	2.61	83.00
	7/17/2019	16.39	5.64	20.5	0.245	210.6	4.03	179.00
	12/5/2019	NS	NS	NS	NS	NS	NS	NS

Table 7. Final Groundwater Water Quality Parameters

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Monitoring Well	Sample Date	Depth to water (feet)	pH (standard units)	Temperature (degrees Celsius)	Conductivity (mS/cm)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
TW-94B	2/7/2019	16.40	10.28	17.6	0.810	-212.3	0.12	103.00
	4/5/2019	16.45	10.31	17.8	1.560	-250.9	0.00	139.00
	7/16/2019	16.31	9.75	27.0	1.00	-73.4	0.11	870.00
	12/5/2019	NS	NS	NS	NS	NS	NS	NS

Notes:

mg/L = milligrams per liter

mS/cm = milliseimens per centimeter

mV = millivolt

NS = not sampled

NTU = nephelometric turbidity units

Table 8. Analytical Data for Subarea 3A

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3A TTZ														
		Location	TW-115A										TW-116A				
		Sample Date	09/19/2016	12/14/2017	04/06/2018	06/29/2018	08/07/2018	11/01/2018	02/14/2019	04/12/2019	07/25/2019	12/10/2019	12/05/2016	12/14/2017	04/06/2018	06/28/2018	09/14/2018
Contaminant of Concern	**Units**																
Carbon tetrachloride	µg/L		22200	10400	4100	9700	9300	5000	4000	3200	2600	1400 J	21600	922	390	730	320
Chloroform	µg/L		14400	8090	3800	7200	8900	5100	4400	3600	3000	2000	7190	753	530	960	780
Tetrachloroethene	µg/L		2710	1080	510	940	850	550	530	290 J	360	320	1390	154	64	160	91
Trichlorofluoromethane	µg/L		12000	7530	4800	6300	5600	3700	3100	4400	1400	1700 J	20800	776	920	510	200
Total	µg/L		56972.6	32358.1	17783	29540	29382	18370	16150	16265	9330	9840	51521.5	2627.76	1985.8	2519.2	1403.1

Table 8. Analytical Data for Subarea 3A

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3A TTZ							Inside 3A TTZ						
		Location	TW-117A													
									Duplicate							
		Sample Date	10/31/2018	02/14/2019	04/11/2019	07/25/2019	12/10/2019	12/07/2016	12/07/2016	12/14/2017	04/05/2018	06/28/2018	09/14/2018	10/31/2018	02/14/2019	04/11/2019
Contaminant of Concern	**Units**															
Carbon tetrachloride	µg/L		82 J	94	29	37	6.2 J	9940	10400	43.8	24	17	11	11	9.4	9.9
Chloroform	µg/L		290	500	320	280	110	10700	11000	531	360	410	380	540	280	310
Tetrachloroethene	µg/L		38	64	49	97	68	2060	2310	33.3	20	21 U	15 U	19 U	14	17
Trichlorofluoromethane	µg/L		110	150 U	82	170	97 J	7270	7570	41	20	15	13	15	9.9 U	10
Total	µg/L		528.7	817.16	688	775	424.2	36442	36882.1	693.1	447.8	493	449	449	332.3	383.8

Table 8. Analytical Data for Subarea 3A

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3A TTZ									
		Location	TW-117A		TW-118A							
		Sample Date	07/24/2019	12/10/2019	12/07/2016	12/14/2017	04/06/2018	06/28/2018	09/14/2018	04/12/2019	07/24/2019	12/16/2019
Contaminant of Concern	**Units**											
Carbon tetrachloride	µg/L		6.6	4.7 J	526	93.2	34	50 U	24	13	8.6	8.8
Chloroform	µg/L		230	170	7740	2850 L	2700	2800	1700	1000	700	340 J
Tetrachloroethene	µg/L		11	8.4	1200	394	250	270 J	240	140	120	120
Trichlorofluoromethane	µg/L		11	4 J	17800	5150	5700	3600	1300 J	1700	960	760 J
Total	µg/L		279.6	198.1	37481	11405.1	12192	3172	4353.2	3567	2099.4	1291.7

Table 8. Analytical Data for Subarea 3A

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3A TTZ										Outside 3A TTZ			
		Location	TW-120A										TW-114A (SIDE)			
		Sample Date	09/19/2016	12/13/2017	04/06/2018	06/29/2018	08/07/2018	11/01/2018	02/14/2019	04/11/2019	07/24/2019	12/10/2019	12/05/2016	12/14/2017	04/05/2018	06/28/2018
Contaminant of Concern	**Units**															
Carbon tetrachloride	µg/L		10800	7070	2100	2300	2000	3000	1700	930	740	350 J	1140	134	34	24
Chloroform	µg/L		14000	9100	4300	5300	9900	8800	4800	3200	3000	1400	739	174	85	72
Tetrachloroethene	µg/L		174	111	44	100 U	100 U	100 U	100 U	25	23 J	20	174	20 U	4.6 U	3.1 U
Trichlorofluoromethane	µg/L		20900	22500	21000	13000	14000	8700	6100	4200	2200	1000 J	9250	2090	260	170
Total	µg/L		46154.9	38858.9	27467	20700	26000	20600	0	8379.1	5693	2770	12288	2418	385.1	274

Table 8. Analytical Data for Subarea 3A

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3A TTZ													
		Location	TW-114A (SIDE)						TW-119A (UP)						TW-127A (DOWN)	
		Sample Date	09/14/2018	10/31/2018	02/13/2019	04/11/2019	08/02/2019	12/16/2019	09/19/2016	12/13/2017	04/06/2018	06/29/2018	09/17/2018	11/01/2018	02/13/2019	04/11/2019
Contaminant of Concern	**Units**															
Carbon tetrachloride	µg/L		12	15	46	46	13	24	182	30.1	50 U	50 U	50	68	130	130
Chloroform	µg/L		65	73	75	69	54	11	969	821	960	5700	16000	12000	3200	3000
Tetrachloroethene	µg/L		2.5 U	2.7 U	3.8	3.9	2.5	1.8	76.3 B	27.4 B	50 U	50 U	50 U	50 U	50 U	25 U
Trichlorofluoromethane	µg/L		71 U	88	290	400	120	480 J	2890	4260	3400	4700	5700	5800	5900	4400
Total	µg/L		155.5	183.8	419	523	194.1	516.8	7377.6	12250.2	13510	17860	27100	22068	15600	12145

Table 8. Analytical Data for Subarea 3A

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3A TTZ										
		Location	TW-127A (DOWN)										
		Sample Date	07/25/2019	12/10/2019	12/06/2016	12/14/2017	06/28/2018	09/14/2018	10/31/2018	02/14/2019	04/11/2019	07/24/2019	12/10/2019
Contaminant of Concern	**Units**												
Carbon tetrachloride	µg/L		150	71 J	15900	222	73	110 J	35 J	57	30	29 J	35
Chloroform	µg/L		3100	1400	5810	287	150	130 J	84 J	68	62	65 J	76
Tetrachloroethene	µg/L		50 U	25 U	715	64.2	29	31 J	16	21	17 J	12 J	14 J
Trichlorofluoromethane	µg/L		3800	2500 J	30700	333	190	130 J	61 J	60	67	44 J	48 J
Total	µg/L		10010	7306	56855.6	1066.12	484.3	435.1	199.5	226.7	196.3	167.3	193

Table 8. Analytical Data for Subarea 3A
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Notes:
µg/L = micrograms per liter
B = analyte reported in blank at similar concentrations
Down = location is down-gradient from TTZ
J = results are estimated.
Side = location is side-gradient to TTZ
TTZ = target treatment zone
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
Up = location is up-gradient to TTZ

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3B TTZ											
		Location	TW-51											
		Sample Date	4/10/2008	02/11/2016	05/03/2016	09/14/2016	02/02/2017	05/08/2017	08/15/2017	12/18/2017	04/05/2018	06/26/2018	09/14/2018	10/31/2018
Contaminant of Concern	**Units**													
Carbon tetrachloride	µg/L		71.4	170	62.9	35	30.1	19.7	24.2	7.79	15	13	7.6	11
Chloroform	µg/L		80.4	94.2	73	52.2	50.3 B	37.2	40.7	20.9 B	28	29	20	24
Tetrachloroethene	µg/L		370	396	202	156	197	156	137	104	99	100	79	100 U
Trichlorofluoromethane	µg/L		--	3630	1760	1220	1130	556	815	321	340	300 J	150	320
Total	µg/L		522.26	4290.2	2097.9	1463.2	1407.4	768.9	1016.9	20.9	483.6	442	256.6	455

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3B TTZ											
		Location	TW-51				INS-TW98B							
		Sample Date	02/12/2019	04/10/2019	07/23/2019	12/06/2019	10/27/2015	02/15/2016	05/02/2016	09/14/2016	02/02/2017	05/05/2017	08/14/2017	12/19/2017
Contaminant of Concern	**Units**													
Carbon tetrachloride	µg/L		13	8.5	18	17	2 K	5 U	5 U	5 U	5 U	1 U	2.5 U	2.5 U
Chloroform	µg/L		26	22	21	23	2	340	152	86.2	54.1 B	76.1	62.6	54.8
Tetrachloroethene	µg/L		120	110	130	120	2 B	5 U	5 U	5 U	5 U	1 U	2.5 U	2.5 U
Trichlorofluoromethane	µg/L		490	240	400 J	600 J	2 J	1580	926	810	513	328	405	313
Total	µg/L		649	380.5	574.9	766.6	2	2148.3	1093.18	906.2	577.1	408.64	476.61	376.83

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3B TTZ											
		Location	INS-TW98B				INS-TW99A							
		Sample Date	04/04/2018	06/26/2018	09/13/2018	10/31/2018	02/12/2019	04/09/2019	07/22/2019	12/05/2019	10/27/2015	02/10/2016	05/02/2016	09/14/2016
Contaminant of Concern	**Units**													
Carbon tetrachloride	µg/L		0.5 U	5 U	5 U	5 U	1 U	0.5 U	0.5 UJ	0.5 U	10 K	1 U	2 U	1 U
Chloroform	µg/L		85	90	77	89	88	61	81	150	634	89.1	72.4	43.3 L
Tetrachloroethene	µg/L		0.5 U	5 U	5 U	5 U	1 U	0.5 U	0.5 UJ	0.5 U	10.3 B	1 U	2 U	1 U
Trichlorofluoromethane	µg/L		490	320 J	320	320	400	210	3400	4800 J	38300 J	398	304	182
Total	µg/L		581.9	420	407	419	493.2	274.2	3492.1	4975.8	41279.64	608.14	543.9	245.91

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3B TTZ											
		Location	INS-TW99A											
		Sample Date	02/02/2017	05/05/2017	08/14/2017	12/18/2017	04/04/2018	06/26/2018	09/13/2018	10/31/2018	02/11/2019	04/09/2019	07/17/2019	12/05/2019
Contaminant of Concern	**Units**													
Carbon tetrachloride	µg/L		1 U	1 U	10 U	1 U	0.5 U	0.5 U	1 U	1 U	1 U	0.5 U	0.5 UJ	0.5 U
Chloroform	µg/L		28.5 B	33.2	36.5 B	31.3	34	31	36	37	30	26	48	90
Tetrachloroethene	µg/L		1 U	1 U	10 U	1 U	0.5 U	0.5 U	1 U	1 U	1 U	0.5 U	0.5 UJ	0.5 U
Trichlorofluoromethane	µg/L		95	206	161	173	260	130 J	140	160	110 J	100	2100	8300 J
Total	µg/L		133.63	420.5	233	224.21	322.1	177.1	192.3	210.9	156.4	145.9	2185	8505.6

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3B TTZ													
		Location	INS-TW95B (DOWN)													
							Duplicate		Duplicate		Duplicate					
		Sample Date	10/26/2015	02/15/2016	05/03/2016	09/15/2016	09/15/2016	02/02/2017	02/02/2017	05/08/2017	05/08/2017	08/15/2017	12/19/2017	04/04/2018	06/26/2018	09/14/2018
Contaminant of Concern	**Units**															
Carbon tetrachloride	µg/L		25 U	25 U	25 U	25 U	25 U	10 U	10 U	20 U	20 U	25 U	10 U	0.5 U	10 U	10 U
Chloroform	µg/L		819	1190	1120	670	729	780	797	826	805	877	534	490	450	420
Tetrachloroethene	µg/L		25 U	25 U	25 U	25 U	25 U	10 U	10 U	20 U	20 U	25 U	10 U	0.6 U	10 U	10 U
Trichlorofluoromethane	µg/L		30900 J	5030	5060	2870	3240	2250	2330	5120	5250	4860	2060	3500	2000 J	1600
Total	µg/L		32370.4	6364.7	6230	3635.9	4074.2	3087.7	3185.5	6078.4	6183.5	5896	2652.4	4037.1	2501	2057

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3B TTZ												
		Location	INS-TW95B (DOWN)												
		Sample Date	11/01/2018	02/11/2019	04/09/2019	07/22/2019	12/06/2019	10/26/2015	02/15/2016	05/03/2016	09/14/2016	02/02/2017	05/09/2017	08/16/2017	12/19/2017
Contaminant of Concern	**Units**														
Carbon tetrachloride	µg/L		10 U	10 U	0.5 U	0.5 UJ	0.5 U	11.1	200 U	200 U	200 U	100 U	100 U	100 U	50 U
Chloroform	µg/L		370	410	370	170	260	169	200 U	200 U	200 U	127	131 B	113	147
Tetrachloroethene	µg/L		10 U	10 U	0.5 U	0.5 UJ	0.7 U	143	200 U	200 U	200 U	100 U	100 U	100 U	50 U
Trichlorofluoromethane	µg/L		1500	1600 J	1300	1600	1700 J	47000 J	38600	33500	24200	11800	13800	12100	8710
Total	µg/L		1906	2064	1707.6	1793.3	2003.4	47724.29	39612	34530	25162	12330	14390	12521	9137

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3B TTZ											
		Location	INS-TW96B (DOWN)								INS-TW97B (SIDE)			
		Sample Date	04/05/2018	06/26/2018	09/13/2018	11/01/2018	02/12/2019	04/10/2019	07/23/2019	12/06/2019	10/26/2015	02/10/2016	05/03/2016	09/14/2016
Contaminant of Concern	**Units**													
Carbon tetrachloride	µg/L		5 U	50 U	50 U	50 U	50 U	0.5 U	0.5 U	0.5 U	348	1080	1190	821
Chloroform	µg/L		130	140	160	160	120	110	95	110	192 J	2070	2000	1410
Tetrachloroethene	µg/L		5 U	50 U	50 U	50 U	50 U	2.4 U	2.3	10	6.72 J	100 U	100 U	100 U
Trichlorofluoromethane	µg/L		24000	3200	800	6200	5200	3800 J	4100 J	5000 J	5420 J	14600	15400	10800
Total	µg/L		24292	9540	8330	6460	5420	3986.2	4254.2	5173.3	6014.01	18274	19091	13384

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3B TTZ											
		Location	INS-TW97B (SIDE)											
						Duplicate		Duplicate		Duplicate		Duplicate		Duplicate
		Sample Date	02/02/2017	05/08/2017	08/15/2017	08/15/2017	12/19/2017	12/19/2017	04/05/2018	04/05/2018	06/26/2018	06/26/2018	09/13/2018	09/13/2018
Contaminant of Concern	**Units**													
Carbon tetrachloride	µg/L		658	586	626	611	593	590	380	320	830	810	770	800
Chloroform	µg/L		1110	748	1020	940	678	691 B	380	370	780	720	550	560
Tetrachloroethene	µg/L		50 U	25 U	50 U	10 U	50 U	50 U	25 U	26 U	27 U	28 U	29 U	30 U
Trichlorofluoromethane	µg/L		7670	6840	6160	6160	6170	6280	4400	4400	6700	5200	5100	6000
Total	µg/L		9703	8307	7983	7850	7586.8	7707.3	5214	5115	8414	6828	6509	7460

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3B TTZ										
		Location	INS-TW97B (SIDE)										INS-TW100B (UP)
				Duplicate		Duplicate		Duplicate		Duplicate		Duplicate	
		Sample Date	10/31/2018	10/31/2018	02/11/2019	02/11/2019	04/10/2019	04/10/2019	07/22/2019	07/22/2019	12/09/2019	12/09/2019	10/26/2015
Contaminant of Concern	**Units**												
Carbon tetrachloride	µg/L		850	850 J	1000	970 E	630	630	730	750	530 J	570	7.91
Chloroform	µg/L		640	680 J	870	850	400	370	260	260	2180	240	99
Tetrachloroethene	µg/L		31 U	5 U	25 U	25 U	50 U	50 U	6.9	6.5 U	25 U	13 U	6.57 B
Trichlorofluoromethane	µg/L		6100	4900 J	7300	7300	3900	3500	4000	4200	3100 J	3200 J	5340
Total	µg/L		7671	6579	9285	9233	4980	4550	5030.9	5274.3	3935	4045	5977.68

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3B TTZ												
		Location	INS-TW100B (UP)										INS-TW101B (SIDE)		
															Duplicate
		Sample Date	2/10/2016	5/2/2016	9/14/2016	2/2/2017	5/5/2017	8/14/2017	12/19/2017	10/31/2018	4/10/2019	12/5/2019	10/26/2015	02/10/2016	02/10/2016
Contaminant of Concern	**Units**														
Carbon tetrachloride	µg/L		2.5 U	2.5 U	5 U	5 U	5 U	10 U	2.5 U	250 U	0.8 U	1 U	25 U	14.2	14.3
Chloroform	µg/L		26.9	43.4	54.5	42.9 B	45.6	50 B	27.2 B	250 U	41 J	22	54	44.7	44.4
Tetrachloroethene	µg/L		2.5 U	2.5 U	5 U	5 U	5 U	10 U	2.5 U	250 U	0.5 U	1 U	25 U	5.25	5.1
Trichlorofluoromethane	µg/L		549	954	1140	731	836	1470	410	71100	550 J	180	2500 J	74500	74600
Total	µg/L		1129.33	1621.41	1703.7	1206.6	1133.9	1639.6	650.64	742.5	267.4	2820	98.91	75572.75	75691.2

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3B TTZ													
		Location	INS-TW101B (SIDE)													
		Sample Date	05/03/2016	09/14/2016	02/03/2017	05/09/2017	08/16/2017	12/19/2017	04/05/2018	06/27/2018	09/14/2018	11/01/2018	02/13/2019	04/10/2019	07/23/2019	12/06/2019
Contaminant of Concern	**Units**															
Carbon tetrachloride	µg/L		500 U	500 U	250 U	500 U	100 U	250 U	5 U	250 U	250 U	250 U	250 U	5 U	1.1	1.4
Chloroform	µg/L		500 U	500 U	250 U	500 U	100 U	250 U	53	250 U	250 U	250 U	250 U	41	42	38
Tetrachloroethene	µg/L		500 U	500 U	250 U	500 U	100 U	250 U	5 U	250 U	250 U	250 U	250 U	5 U	0.9 U	0.9
Trichlorofluoromethane	µg/L		103000	98100	58000	74600	26600	71100	100000	17000	26000	16000	58000	32000	11000 J	6300 J
Total	µg/L		105203	100418	59193	76100	27020	72537	100933	17750	26750	16750	58750	32213	11264.2	6565.1

Table 9. Analytical Data for Subarea 3B
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Notes:
µg/L = micrograms per liter
B = analyte reported in blank at similar concentrations
Down = location is down-gradient from TTZ
J = result is estimated
K = result may be estimated high
Side = location is side-gradient to TTZ
TTZ = target treatment zone
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
Up = location is up-gradient to TTZ

Table 10. Analytical Data for Subarea 3C

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3C TTZ																	
		Location	TW-121A												TW-122B					
		Sample Date	09/19/2016	02/08/2017	05/17/2017	12/10/2017	03/27/2018	06/25/2018	08/07/2018	10/29/2018	02/05/2019	04/04/2019	07/11/2019	12/05/2019	09/19/2016	02/08/2017	05/17/2017	12/08/2017	03/27/2018	
Contaminant of Concern	**Units**																			
Carbon tetrachloride	µg/L		19100	1360	1280	1760	1300	3200	1300	430	600	550	370	460	31.8	25 U	25 U	10 U	10 U	
Chloroform	µg/L		1760	78.4 B	52.5	56.5	71	110	54	50 U	50 U	23 U	17	26	242	108 B	65.1	29.3	15	
Tetrachloroethene	µg/L		12000	11700	7920	5630	5900	14000	6800	3800	3300 J	2700	2400	3800	15400	4920	3690	1660	1300	
Trichlorofluoromethane	µg/L		11000	758 B	764	603	200	430	180	72	76	55	38	61	786	120 B	73	32.6	10 U	
Total	µg/L		48319	14051.4	10092.6	8293.5	7471	17511	8334	4892	4026	3328	3134	4347	16830.5	5173	3853.1	1731.9	1335	

Table 10. Analytical Data for Subarea 3C

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3C TTZ																
		Location	TW-122B							TW-124B									
		Sample Date	06/25/2018	09/07/2018	10/29/2018	02/05/2019	04/02/2019	07/11/2019	12/04/2019	09/19/2016	02/10/2017	05/17/2017	12/10/2017	03/27/2018	06/25/2018	09/07/2018	10/29/2018	02/05/2019	04/02/2019
Contaminant of Concern	**Units**																		
Carbon tetrachloride	µg/L		10 U	10 U	10 U	25 U	5 U	5 U	2.5 U	10 U	50 U	50 U	10 U	25 U	25 U	25 U	25 U	50 U	10 U
Chloroform	µg/L		18	20	30	25 U	21	20	12	1630	225 B	176	29.3	100	160	140	90	96	67
Tetrachloroethene	µg/L		1400	1600	1100	1600	1300	1000	540	21100	7370	5120	1040	2700	4400	2400	1700	3600 J	2400
Trichlorofluoromethane	µg/L		15	16	21	25 U	11	10	5.3	9610	1080	562	121	290	460	250	230	210	120
Total	µg/L		1543	1756	1161	1675	1337	1035	559.8	33070.6	8801.8	5961.2	1240.3	3465	5767	3335	2385	3956	2597

Table 10. Analytical Data for Subarea 3C
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3C TTZ														
		Location	TW-124B		TW-123B (SIDE)												TW-125B (DOWN)
		Sample Date	07/11/2019	12/04/2019	09/19/2016	02/08/2017	05/17/2017	12/10/2017	03/29/2018	06/25/2018	09/07/2018	10/29/2018	02/05/2019	04/04/2019	07/11/2019	12/05/2019	09/19/2016
Contaminant of Concern	**Units**																
Carbon tetrachloride	µg/L		10 U	2.5 U	10 U	25 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	25 U	25 U	10 U	10 U
Chloroform	µg/L		76	10	422	606 B	730	302	750	810	830	950	960	830	880	530	3580
Tetrachloroethene	µg/L		2100	350	5690	6470	7110	7100	6500	8500	8400	8500	6500 J	6100	6600	4700	14400
Trichlorofluoromethane	µg/L		210	43	1950	1670	2170	924	1300	1500	1500	1100	1100	680	1100	510 J	16500
Total	µg/L		2628	439.5	8412.8	8985.8	10563	8453	9930	14236	13126	11860	9805	8385	9628	6527	35572.4

Table 10. Analytical Data for Subarea 3C
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3C TTZ													
		Location	TW-125B (DOWN)													
						Duplicate		Duplicate		Duplicate						
		Sample Date	02/10/2017	05/17/2017	12/08/2017	12/08/2017	03/27/2018	03/27/2018	06/25/2018	06/25/2018	09/07/2018	09/07/2018	10/29/2018	02/05/2019	04/02/2019	12/04/2019
Contaminant of Concern	**Units**															
Carbon tetrachloride	µg/L		25 U	25 U	10 U	10 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	2.5 U	2.5 U
Chloroform	µg/L		410	480	58.8	61.6	28	29	49	48	42	43	40	14 U	22	13
Tetrachloroethene	µg/L		3520	2980	1280	1340	640	700	1200	1100	1200	1300	1000	620	640	510
Trichlorofluoromethane	µg/L		1920	1450	176	181	61	62	70	55	53	51	47	23	21	19
Total	µg/L		6050.9	5001.9	1585.5	1642.7	796	734	1330.4	1213	1427.5	1506.3	1150	662	688.4	544.5

Table 10. Analytical Data for Subarea 3C
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3C TTZ															
		Location	TW-126B (UP)															
												Duplicate		Duplicate		Duplicate		Duplicate
		Sample Date	09/19/2016	02/10/2017	05/17/2017	12/10/2017	03/27/2018	06/25/2018	09/07/2018	10/29/2018	02/05/2019	02/05/2019	04/04/2019	04/04/2019	07/11/2019	07/11/2019	12/05/2019	12/05/2019
Contaminant of Concern	**Units**																	
Carbon tetrachloride	µg/L		10 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	50 U	50 U	13 U	13 U	13 UJ	13 U	5 U	5 U
Chloroform	µg/L		829	1830	1300	703	1100	1300	1200	1200	740	880	1300	1500	1000 J	800	770	870
Tetrachloroethene	µg/L		4100	3860	3480	2850	2900	3500	3500	3400	3600 J	3400 J	3500	4000	3400 J	3100	2500	2300
Trichlorofluoromethane	µg/L		710	1310	1190	515	680	890	720	650	490	530	590	570	530 J	450	470	380 J
Total	µg/L		5803.5	7168.8	6172.4	4144.3	5132	7175	7320	6328	5520	5460	6030	6680	5470	4869	4321	4110

Table 10. Analytical Data for Subarea 3C
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Notes:
µg/L = micrograms per liter
Down = location is down-gradient from TTZ
J = results are estimated.
Side = location is side-gradient to TTZ
TTZ = target treatment zone
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
Up = location is up-gradient to TTZ
Up = location is up-gradient to TTZ

Table 11. Analytical Data for Subarea 3D
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3D TTZ														
		Location	INS-TW87A														
		Sample Date	10/28/2015	02/16/2016	05/06/2016	09/16/2016	02/08/2017	05/16/2017	08/23/2017	12/17/2017	04/03/2018	06/27/2018	09/12/2018	10/30/2018	02/08/2019	04/05/2019	07/15/2019
Contaminant of Concern	**Units**																
Carbon tetrachloride	µg/L		56800 J	7850	9540	7800	2710	2640	2710	706	440	860	1200	1000	460	1000	280
Chloroform	µg/L		459	209	139	92.7	55.3 B	59.2	69.9	39 B	34	54	47	67	37	61	51
Tetrachloroethene	µg/L		58700	13000	12600	13200	6020	5570	5510	2400	1700	3400	3400	3000	1700	3500	1400
Trichlorofluoromethane	µg/L		779 J	101	105	77	50 U	53.6 B	50 U	20 U	13	23	30	35 J	17	40	28
Total	µg/L		116960.24	21160	22384	21169.7	8835.3	8322.8	8289.9	3165	2187	4337	4677	4102	2214	4601	1759

Table 11. Analytical Data for Subarea 3D
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3D TTZ														
		Location	INS-TW88A														
		Sample Date	10/27/2015	02/12/2016	05/04/2016	09/15/2016	02/07/2017	05/11/2017	08/18/2017	12/17/2017	04/02/2018	06/26/2018	09/12/2018	10/29/2018	02/07/2019	04/05/2019	07/15/2019
Contaminant of Concern	**Units**																
Carbon tetrachloride	µg/L		3120	594	379	230	127	375	167	188	22	220	170	140 J	140	250	160 J
Chloroform	µg/L		166	169	120	73.7	37.2	77.7	105	70.7	6.3	120	120	120 J	110	130	120 J
Tetrachloroethene	µg/L		4460	1620	1000	763	507	950	468	714	87	660 J	500 J	81 J	510	710	550 J
Trichlorofluoromethane	µg/L		235 J	131	78.5 B	44.7 B	20.7	58.6	48.4	36.8	3.8	54	38	40 J	34	57	55 J
Total	µg/L		8029.1	2514	1577.5	1111.4	691.9	1461.3	792.53	1012.45	119.1	1060	833.4	389.9	794	1153	891.3

Table 11. Analytical Data for Subarea 3D
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3D TTZ															
		Location	INS-TW90B															
						Duplicate		Duplicate										
		Sample Date	10/27/2015	02/16/2016	05/04/2016	05/04/2016	09/15/2016	09/15/2016	02/06/2017	05/11/2017	08/18/2017	12/15/2017	03/30/2018	06/27/2018	09/12/2018	10/30/2018	02/08/2019	07/17/2019
Contaminant of Concern	**Units**																	
Carbon tetrachloride	µg/L		47900	240	75.2	77.2	75.2	76	95	245	1290	2000	1800	1400	2800	3300	2400	3500 J
Chloroform	µg/L		2060	485	224	227	172	170	132	211	339	441	550	660	920	850	1000	1000 J
Tetrachloroethene	µg/L		36600	723	313	312	307	313	343	573	1760	2970	2700	2700	4400	4600	4600	5100 J
Trichlorofluoromethane	µg/L		3820 J	242	105	117	78.1	74.5	49.1	105	331	466	640	420	870	680	920	460 J
Total	µg/L		90682.34	1695.23	720.25	0	632.3	633.5	619.1	1140.46	3728.42	5877	5690	5180	9001	9430	8938	10060

Table 11. Analytical Data for Subarea 3D

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3D TTZ															
		Location	INS-TW92B															
		Sample Date	10/28/2015	10/28/2015	02/15/2016	05/04/2016	09/15/2016	02/06/2017	05/11/2017	08/21/2017	12/12/2017	03/30/2018	06/27/2018	09/12/2018	10/31/2018	02/07/2019	04/09/2019	07/17/2019
Contaminant of Concern	**Units**																	
Carbon tetrachloride	µg/L		31300	33500	264	118	44.4	27.4	540	1670	2760	2100	2500	3800	4800	4400	4000	6200
Chloroform	µg/L		6360	6900	919	609	226	112	292	619	897	890	2000	1300	2200	2200	2400	1900
Tetrachloroethene	µg/L		21400	21800	739	529	223	97.9	638	1850	3230	2600	3600	3500	4200	4500	5300	6200
Trichlorofluoromethane	µg/L		11900 J	13600 J	279	578	104	40.2	141	406	843	670	2200	1000 J	1900	1800	2100	1900
Total	µg/L		71633.75	76661.02	2225.14	1848.72	602.75	287.34	1618.71	4564.15	7749.5	6286	10631	9615	13159	12956	13859	16251

Table 11. Analytical Data for Subarea 3D
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Inside 3D TTZ														
		Location	INS-TW93B														
		Sample Date	10/27/2015	02/12/2016	05/05/2016	09/15/2016	02/07/2017	05/15/2017	08/22/2017	12/15/2017	04/03/2018	06/27/2018	09/13/2018	10/30/2018	02/07/2019	04/09/2019	07/17/2019
Contaminant of Concern	**Units**																
Carbon tetrachloride	µg/L		15000	1710	1200	906	869	1890	2290	2160	2900	3400	3400	3800	4600	3500	3600 J
Chloroform	µg/L		7790	3570	1950	1580	1220	1160	1490	1010	2800	1700	1400	2400	3000	2600	2600 J
Tetrachloroethene	µg/L		8340	2040	1500	903	779	2100	1610	2310	1500	3200	3600	3300	3500	2900	2400 J
Trichlorofluoromethane	µg/L		11000 J	948	581	488	457	668	1090	576	2200	990 J	780	1500 J	1800	1600	1600 J
Total	µg/L		42486.5	8340.4	5265.7	3895.6	3341.1	5831.6	6511.4	6056	7248	9304	9180	11027	12900	10600	10233

Table 11. Analytical Data for Subarea 3D
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3D TTZ														
		Location	INS-TW86A (UP)														
		Sample Date	10/26/2015	02/11/2016	05/05/2016	09/15/2016	02/07/2017	05/12/2017	08/22/2017	12/17/2017	04/02/2018	06/27/2018	09/12/2018	10/30/2018	02/08/2019	04/05/2019	07/16/2019
Contaminant of Concern	**Units**																
Carbon tetrachloride	µg/L		230	457	516	427	344	458	336	413	220	660	580	700	630	550	530
Chloroform	µg/L		62.9	28.7	23.9	21.8	21.5 B	40.7	73.9	61.4	33	47	57	56	53	50	48
Tetrachloroethene	µg/L		576	908	866	821	783	1030	863	1060	640	1800	1600	1900	2100	1800	2000
Trichlorofluoromethane	µg/L		62.3 J	322	257	312	235	352	284	263	110	340	290	280	250	230	200
Total	µg/L		942.64	8693.6	1675	1592.5	1388.8	1885.89	1570.07	1797.4	1013.6	2847	2527	2936	3038.3	2630	2778

Table 11. Analytical Data for Subarea 3D
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3D TTZ												
		Location	INS-TW89A (SIDE/DOWN)												
		Sample Date	10/27/2015	02/12/2016	05/05/2016	09/15/2016	02/08/2017	05/15/2017	08/21/2017	12/15/2017	04/03/2018	06/27/2018	09/12/2018	10/30/2018	08/02/2019
Contaminant of Concern	**Units**														
Carbon tetrachloride	µg/L		10.2 K	10 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	µg/L		829	542	315	104	42.4 B	10 U	20.4 B	36.8	100	58	14	29	130
Tetrachloroethene	µg/L		7280	2050	2940	2450	1760	2010	1690	1840	1800	1600	2100	2200	1800
Trichlorofluoromethane	µg/L		644 J	214	144	48	37.1	22.6	26.2	53.2	110	80	22	31	150
Total	µg/L		8955.58	2816	3409	2622	1860.6	2079.9	1764.2	1955	2033	1759	2146	2270	2090

Table 11. Analytical Data for Subarea 3D
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3D TTZ														
		Location	INS-TW91B (SIDE)														
		Sample Date	10/27/2015	02/12/2016	05/04/2016	09/16/2016	02/08/2017	05/16/2017	08/23/2017	12/17/2017	04/04/2018	06/28/2018	09/13/2018	10/30/2018	02/08/2019	04/09/2019	07/16/2019
Contaminant of Concern	**Units**																
Carbon tetrachloride	µg/L		2970	1670	1270	636	418	680	676	1000	1300	1400	1300	1400	1400	1200	1400 J
Chloroform	µg/L		5750	6430	6810	4030	3210	3450	4680	4420	3500	3600	4100	3900	2600	3200	2300 J
Tetrachloroethene	µg/L		2760	3220	2920	1530	1330	1900	1640	1850	2000	2200	2200	1800	1500	2000	1900 J
Trichlorofluoromethane	µg/L		21700 J	23800	23800	9540	5850	6760	8930	9570	9400	5900	7200	8200 J	5700	5300	4300 J
Total	µg/L		34325.81	36410	36260	16326	10956	13174	16454.2	17232	16370	13270	15030	15530	11340	11840	9996

Table 11. Analytical Data for Subarea 3D
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

		Subarea	Outside 3D TTZ													
		Location	INS-TW94B (DOWN)													
		Sample Date	10/27/2015	05/06/2016	09/16/2016	02/07/2017	05/16/2017	08/23/2017	12/17/2017	04/03/2018	06/27/2018	09/12/2018	10/30/2018	02/07/2019	04/05/2019	07/16/2019
Contaminant of Concern	**Units**															
Carbon tetrachloride	µg/L		2.69 K	25 U	25 U	25 U	25 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	25 U	25 UJ
Chloroform	µg/L		1200	1580	1050	851	908	1090	1090	780	1000	970	690	1100	1200	790 J
Tetrachloroethene	µg/L		5820	6390	6530	4700	6550	5190	5920	5400	5900	5000	4000	5800	5400	4300 J
Trichlorofluoromethane	µg/L		298	235	109	73.7	98.4	97.7	96.9	67	110	89	70	86	80	82 J
Total	µg/L		7541.2	8332	7995.4	5685.6	7641.1	6583.7	7156.9	6297	7060	6109	4810	7108	6769	5288

Table 11. Analytical Data for Subarea 3D

2019 Operation, Maintenance, and Monitoring Activities Memorandum

UCC Institute Facility, Institute, West Virginia

Notes:
µg/L = micrograms per liter
B = analyte reported in blank at similar concentrations
Down = location is down-gradient from TTZ
J = result is estimated
K = result may be estimated high
Side = location is side-gradient to TTZ
TTZ = target treatment zone
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate
Up = location is up-gradient to TTZ

Figures

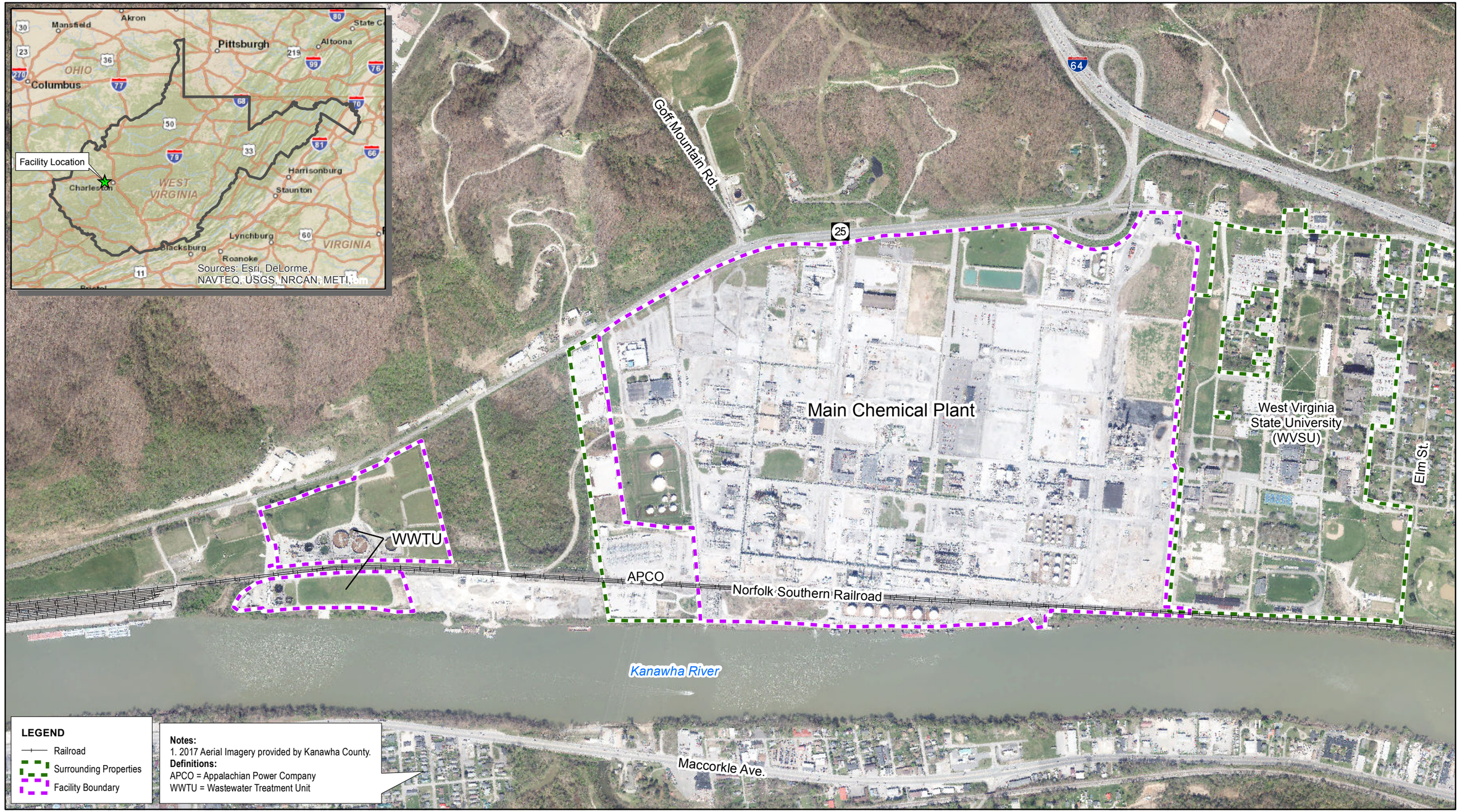


Figure 1.
Facility Location Map
2019 Operation, Maintenance, and Monitoring Activities Memorandum
Union Carbide Corporation Institute Facility, Institute, West Virginia

JACOBS

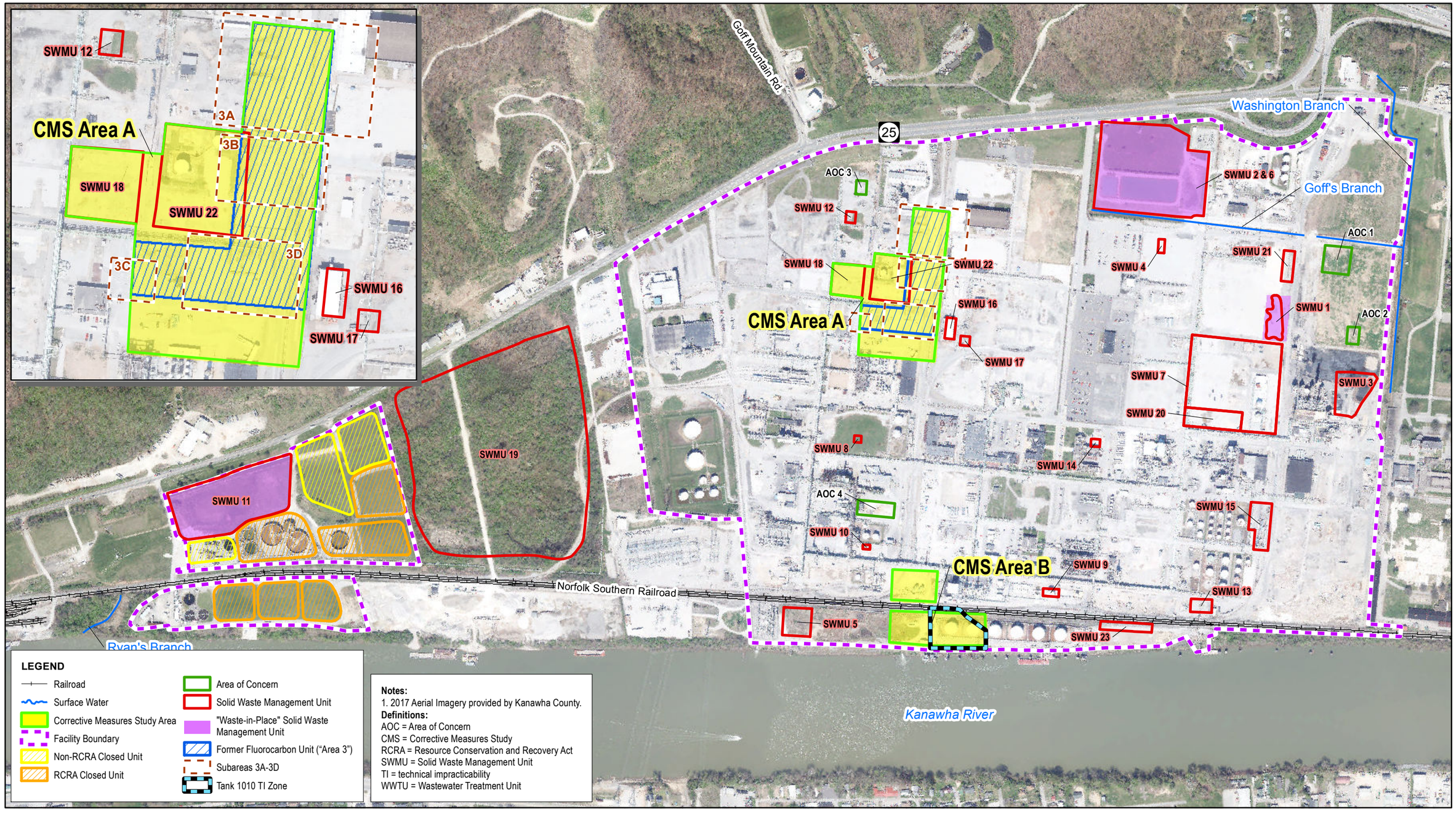


Figure 2.
Area Designation Map
2019 Operation, Maintenance, and Monitoring Activities Memorandum
Union Carbide Corporation Institute Facility, Institute, West Virginia

JACOBS

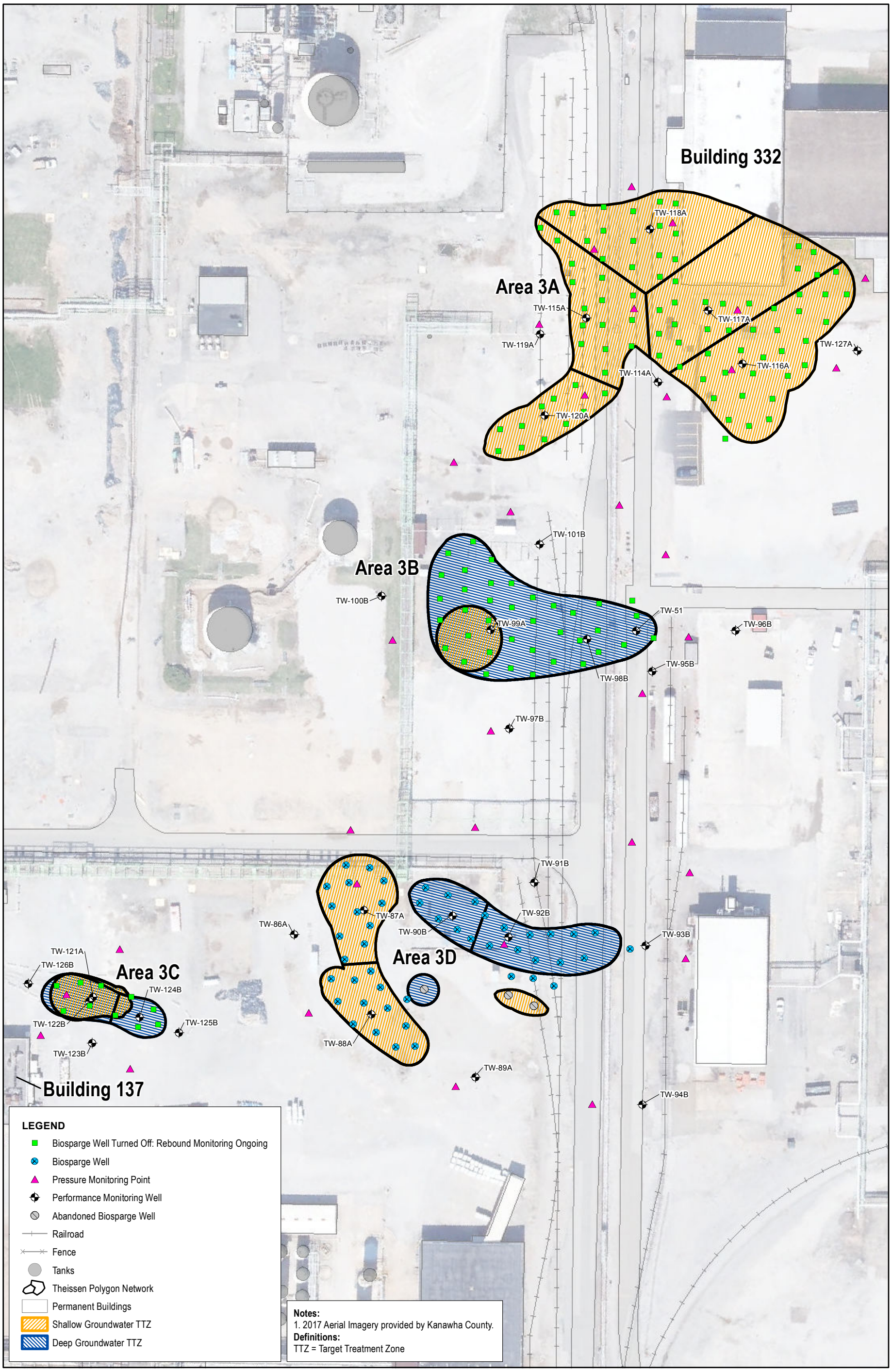
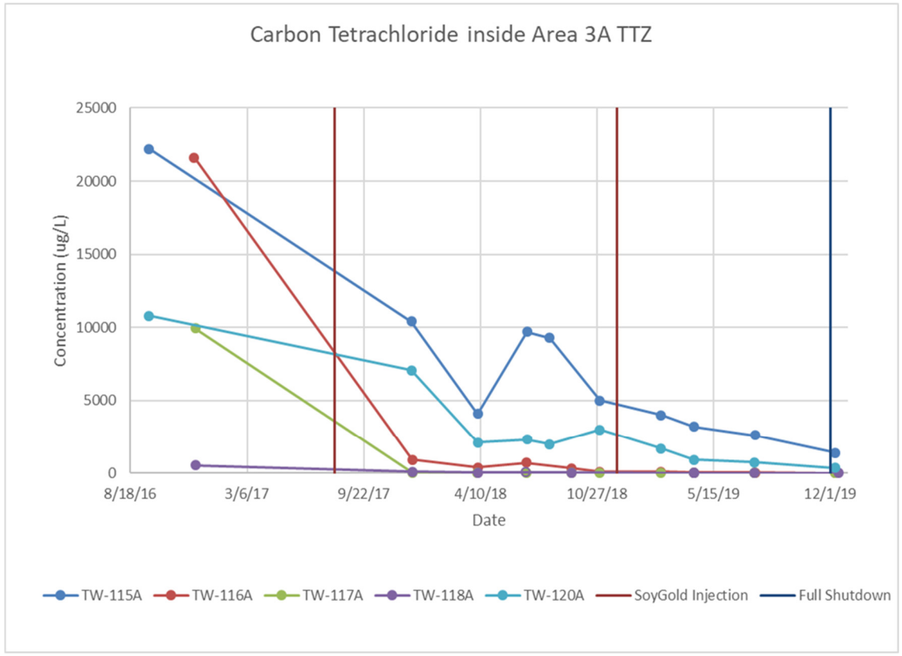
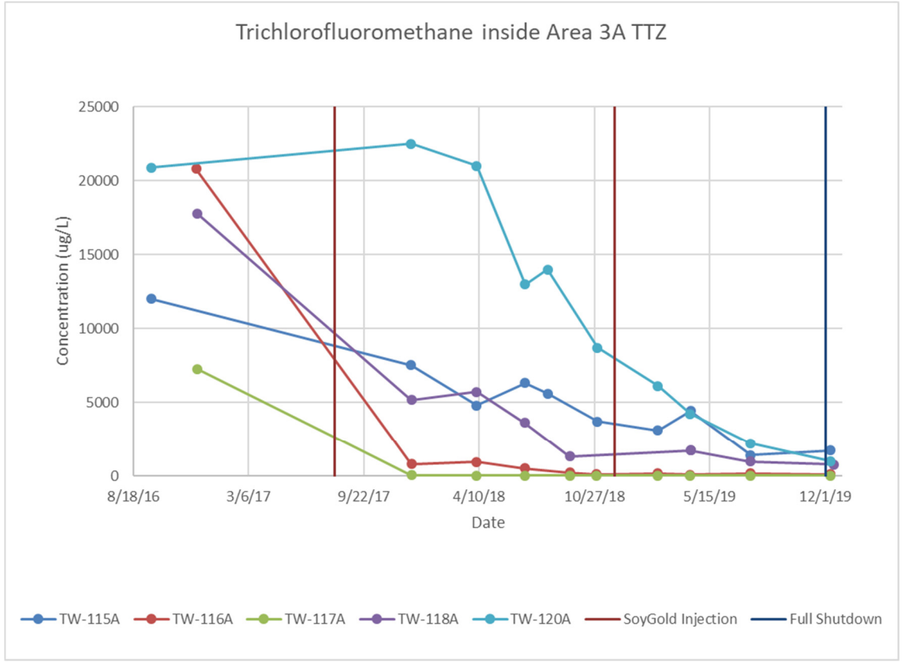
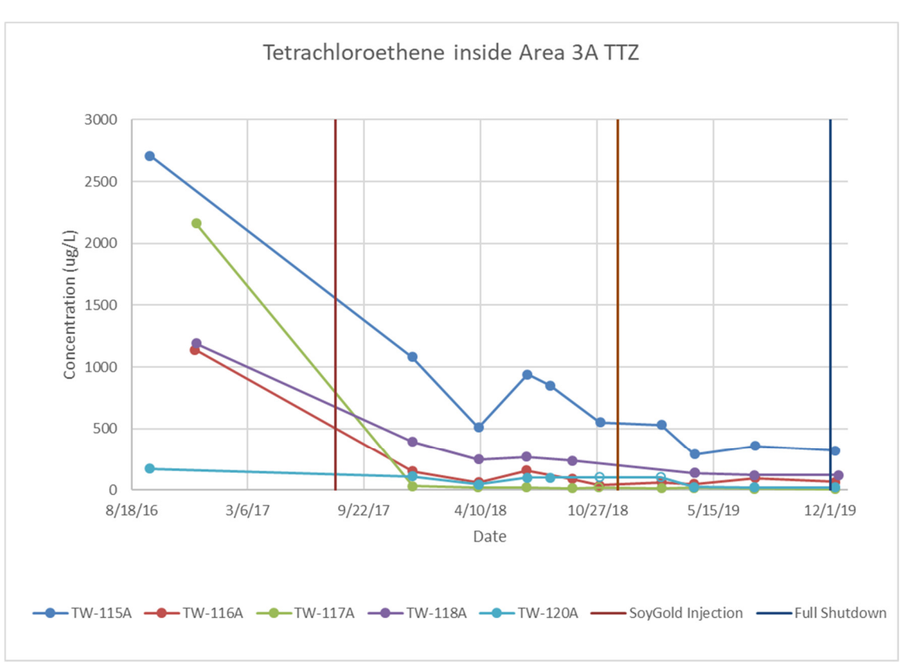


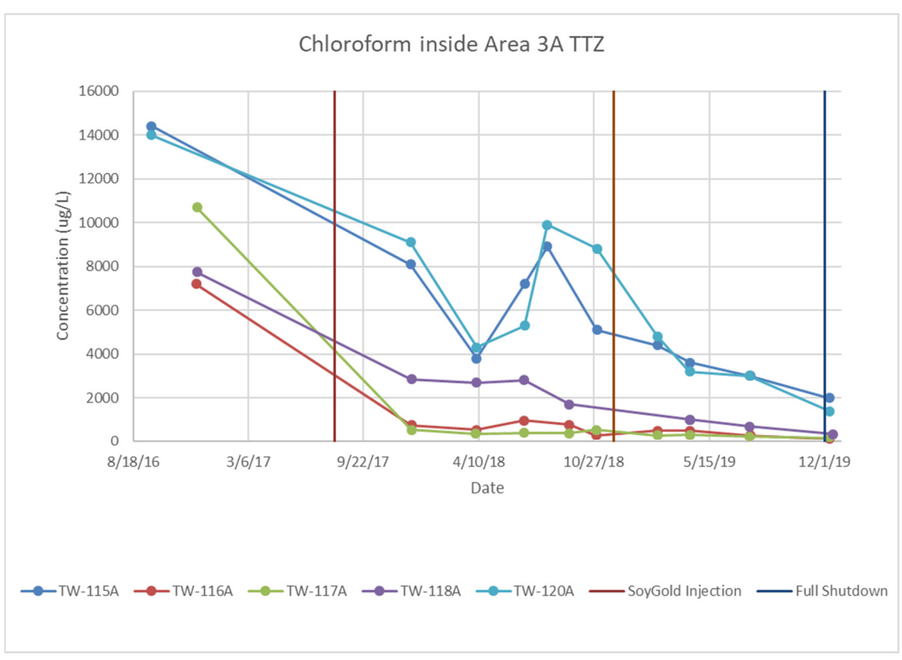
Figure 3.
Site Map - Areas 3A, 3B, 3C and 3D
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

JACOBS



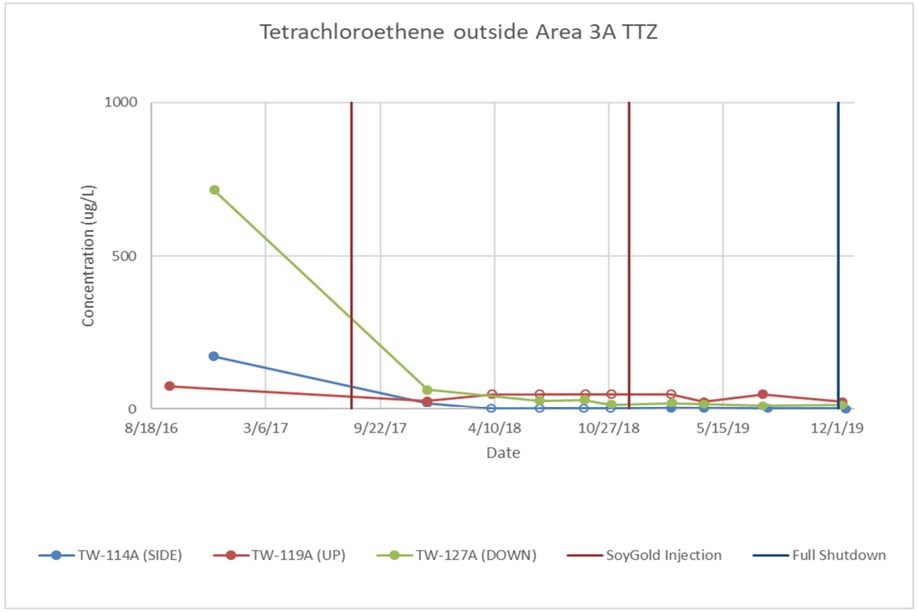


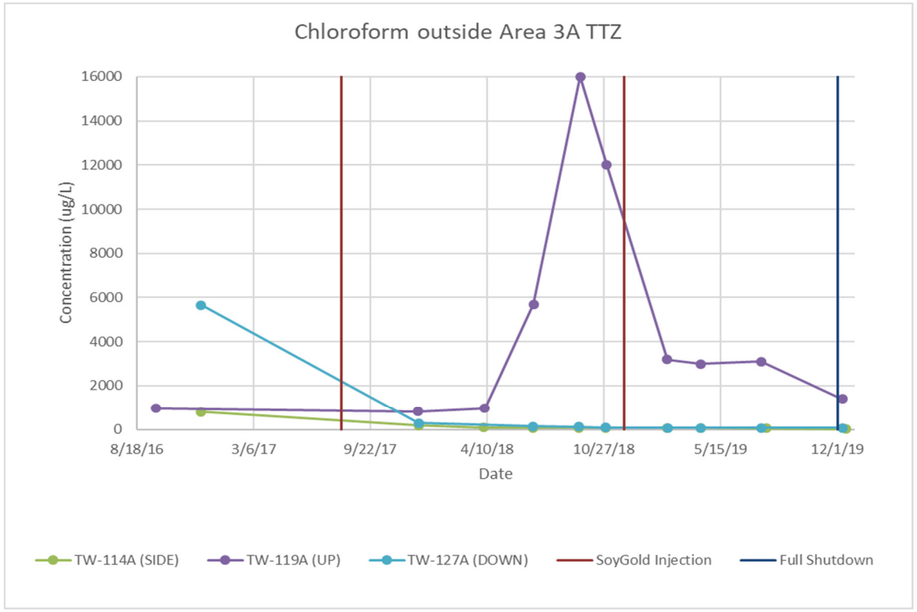


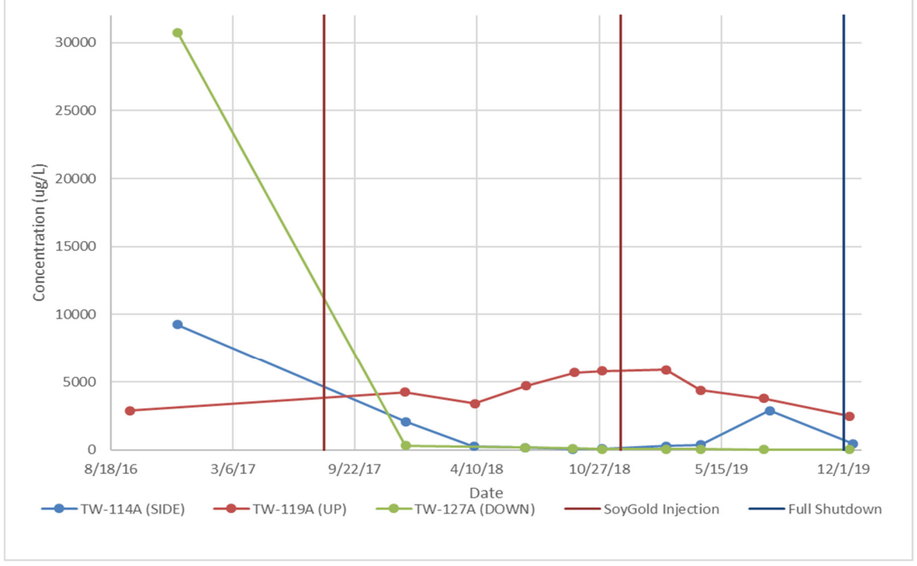


Notes: TTZ = target treatment zone

Figure 4. Trend Graphs for Constituents of Concern Inside Area 3A Target Treatment Zone
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

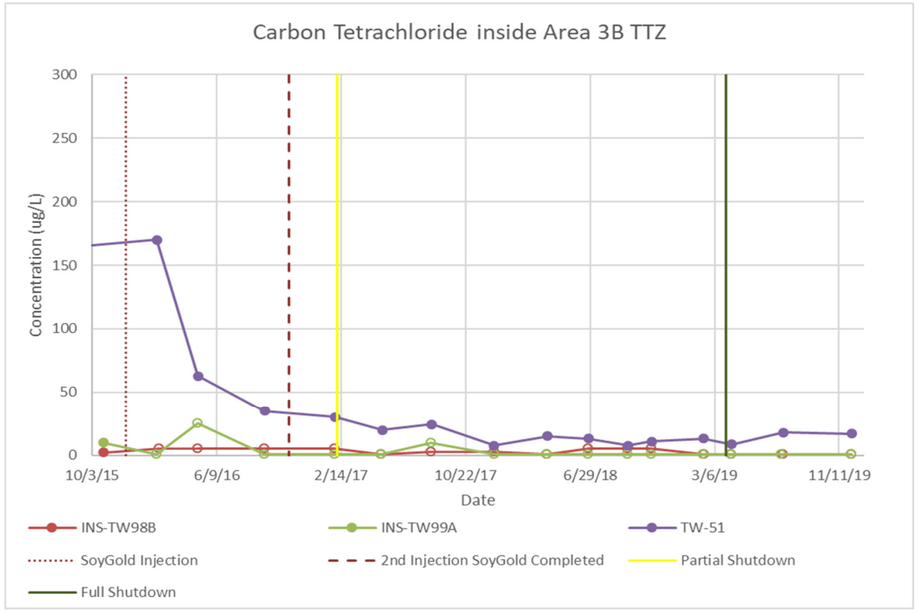


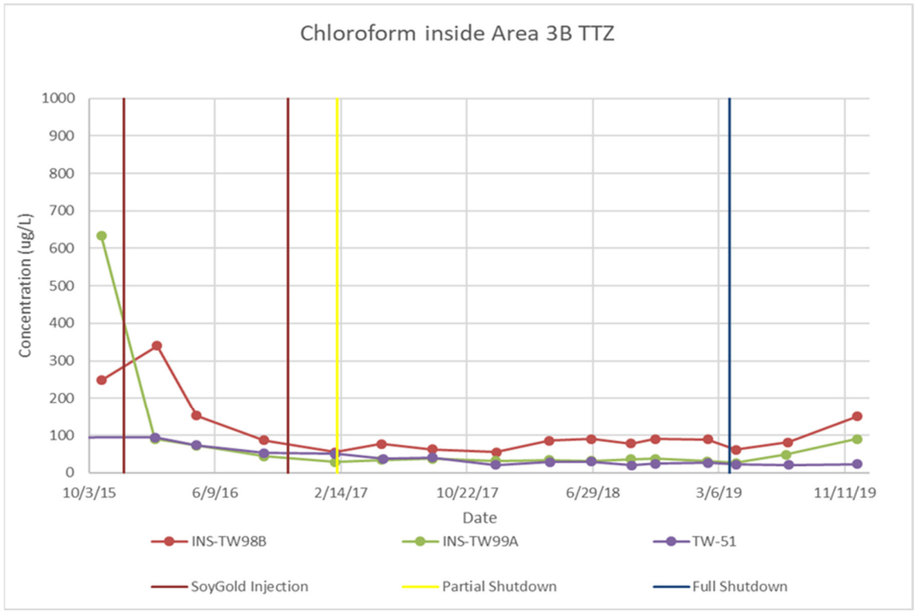


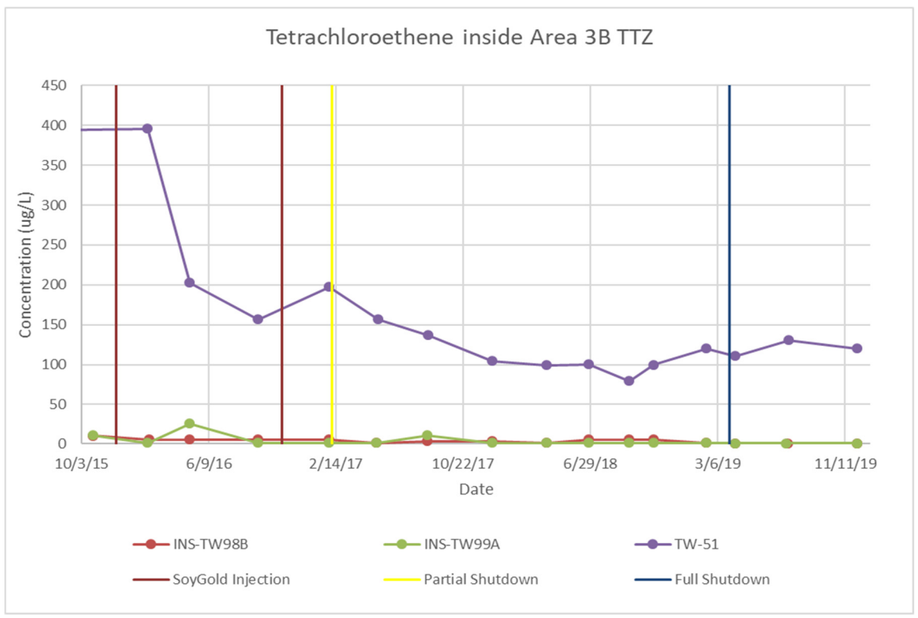


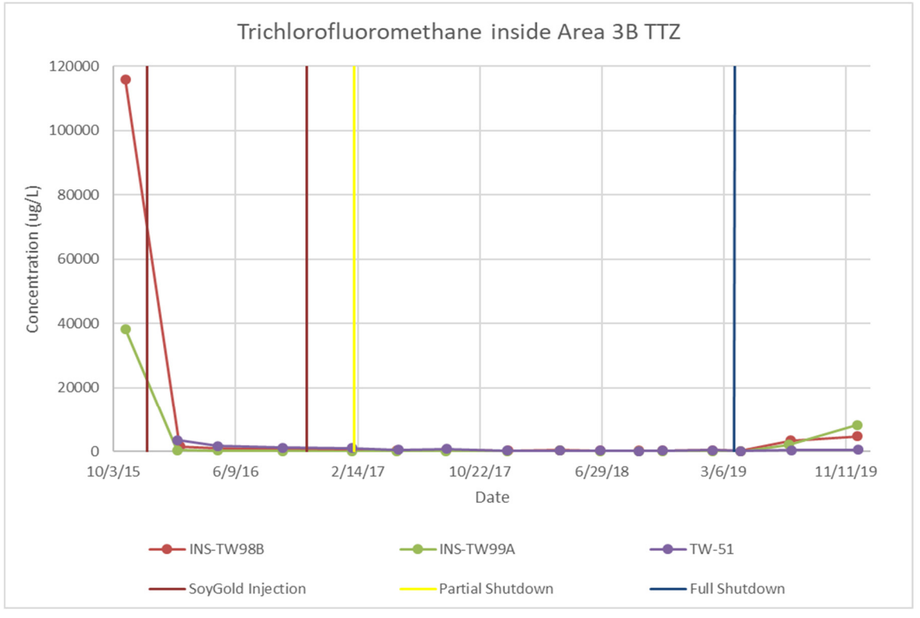
Notes: TTZ = target treatment zone
DOWN = down-gradient
SIDE = side-gradient
UP = upgradient

Figure 5. Trend Graphs for Constituents of Concern Outside Area 3A Target Treatment Zone
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia



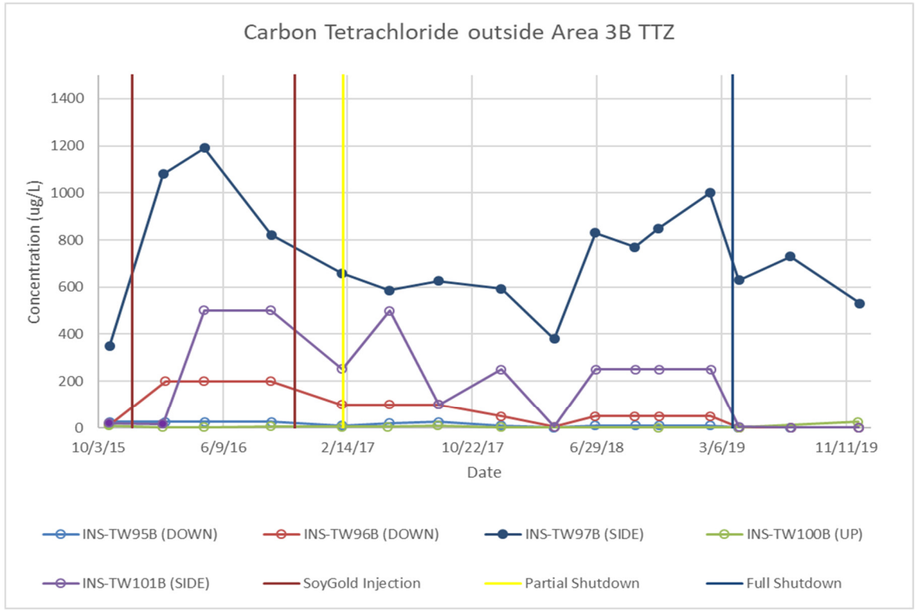


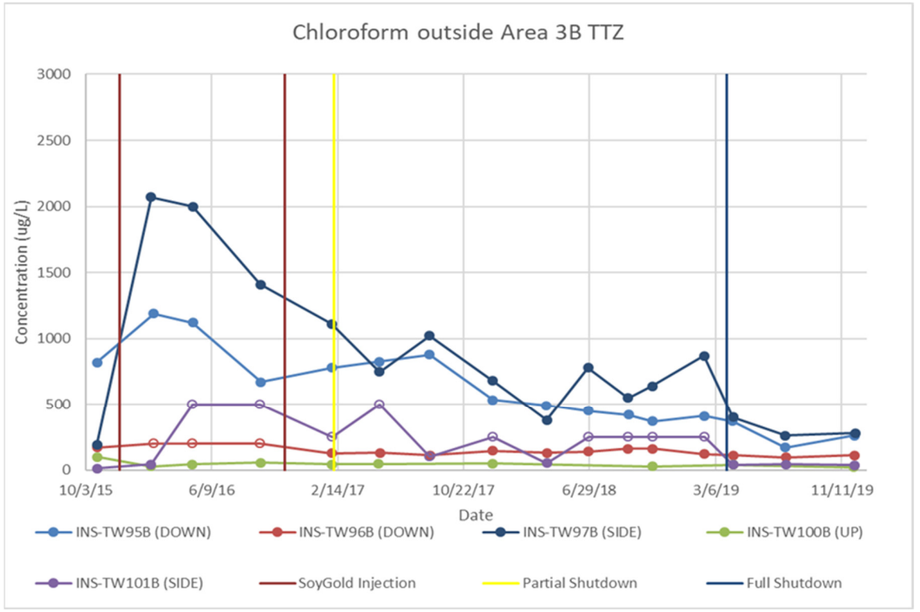


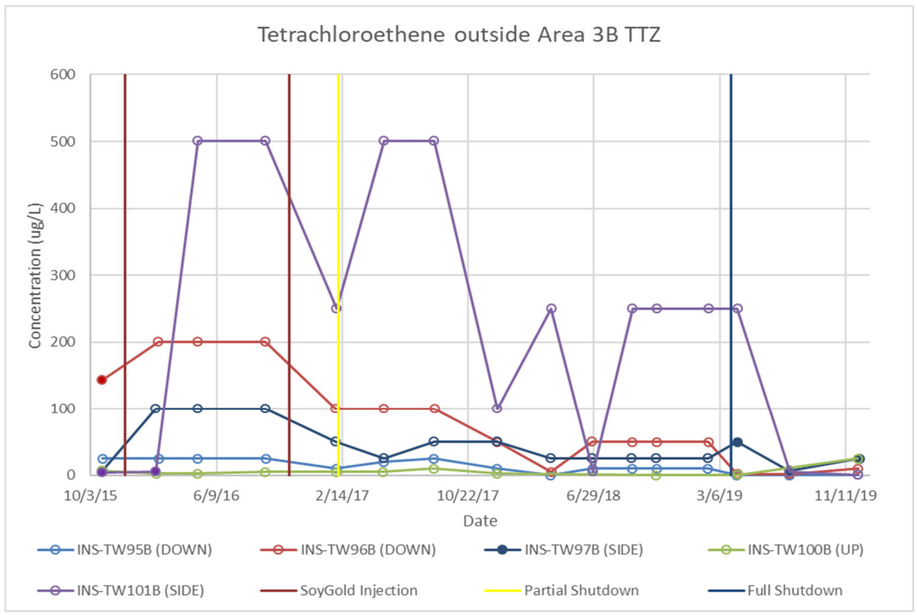


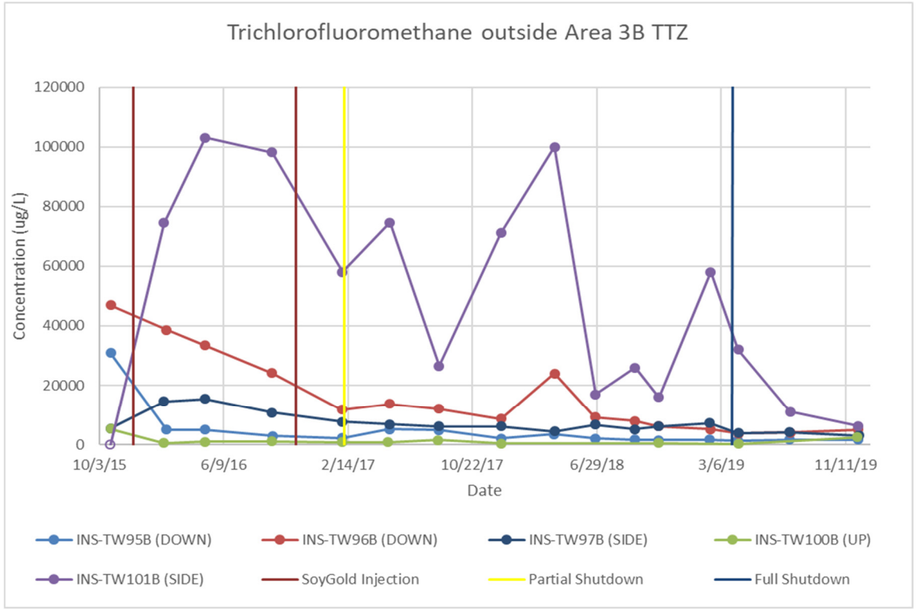
Note :TTZ = target treatment zone

Figure 6. Trend Graphs for Constituents of Concern Inside Area 3B Target Treatment Zone
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia



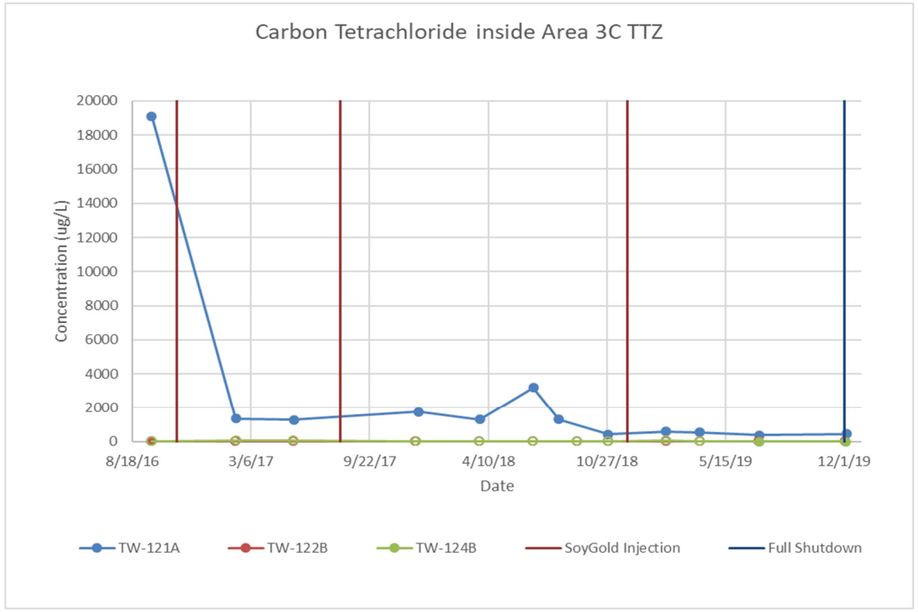


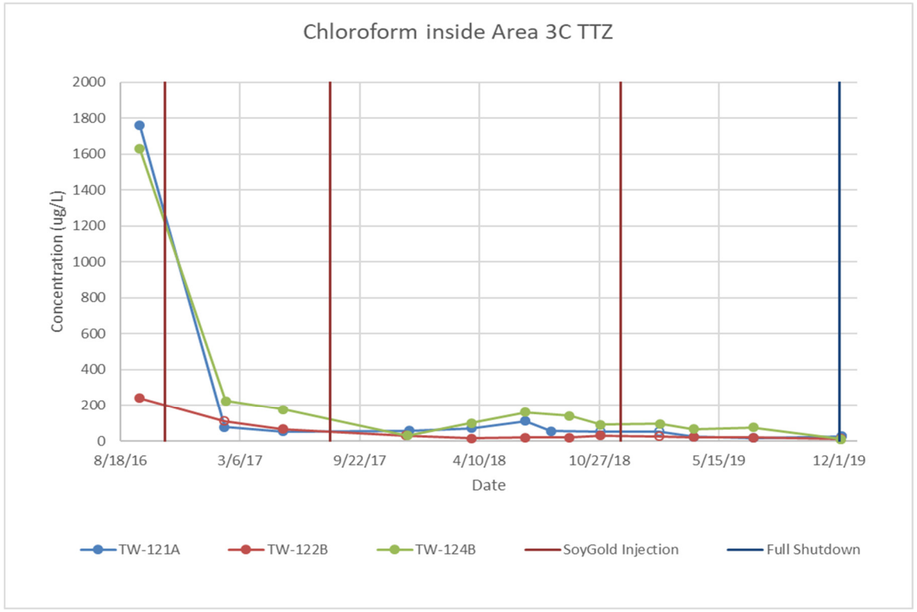


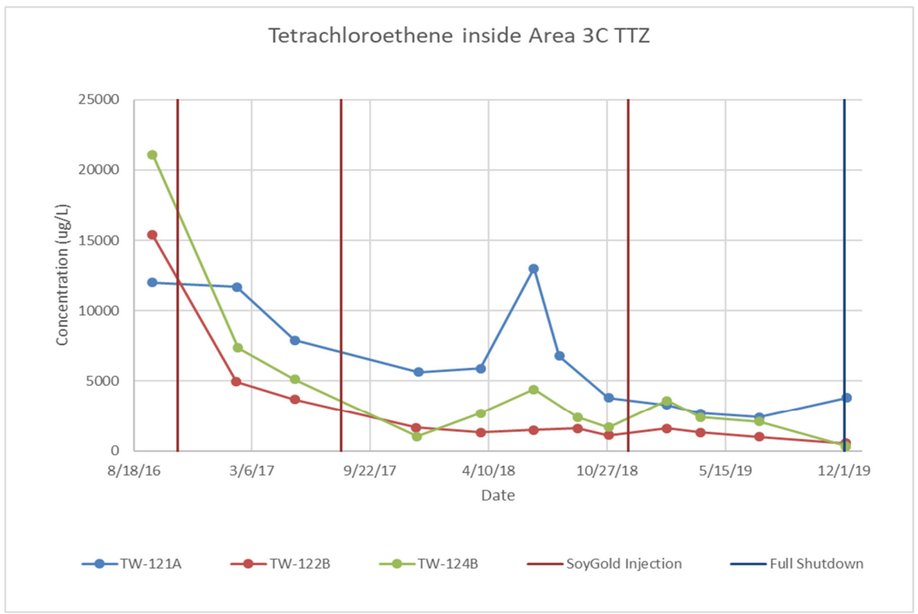


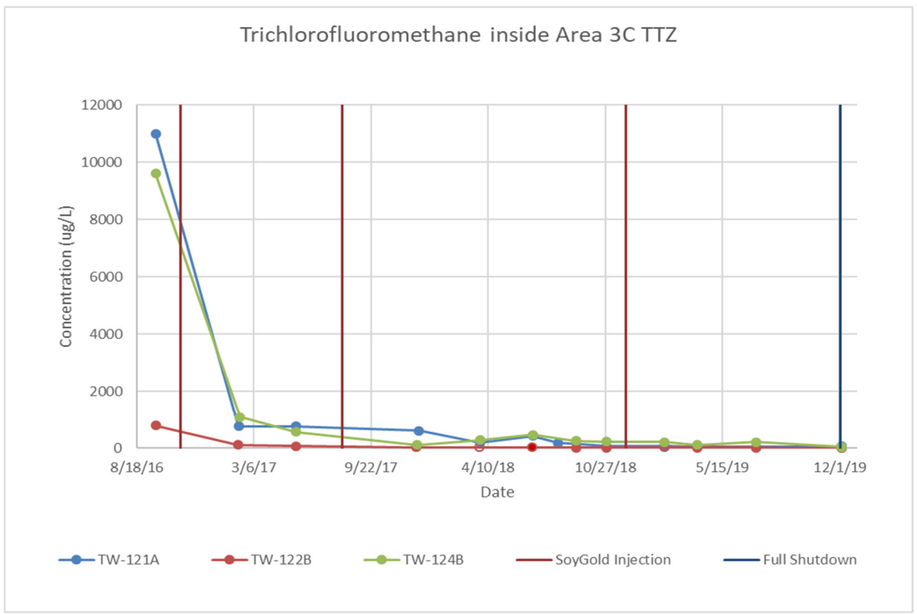
Notes: TTZ = target treatment zone
DOWN = down-gradient
SIDE = side-gradient
UP = upgradient

Figure 7. Trend Graphs for Constituents of Concern Outside Area 3B Target Treatment Zone
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia



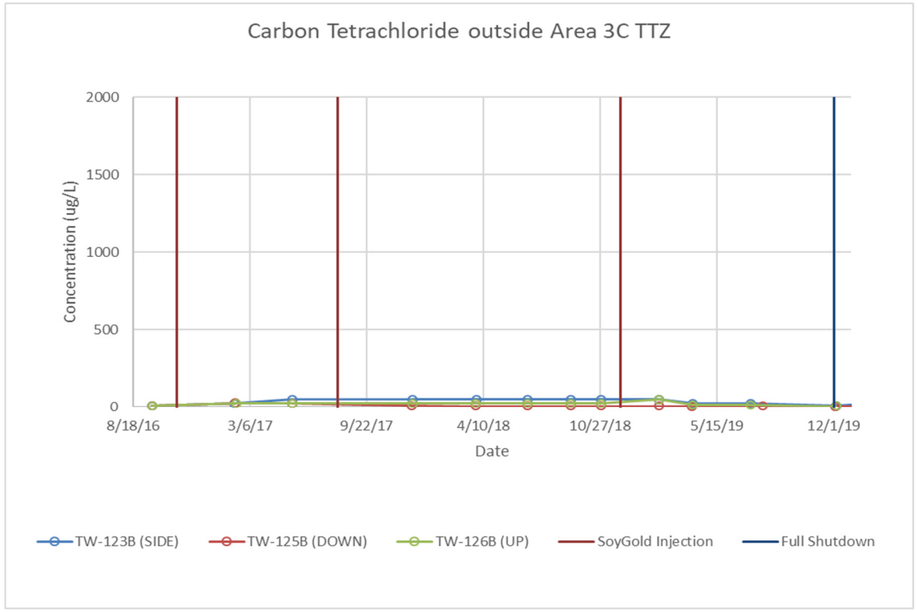


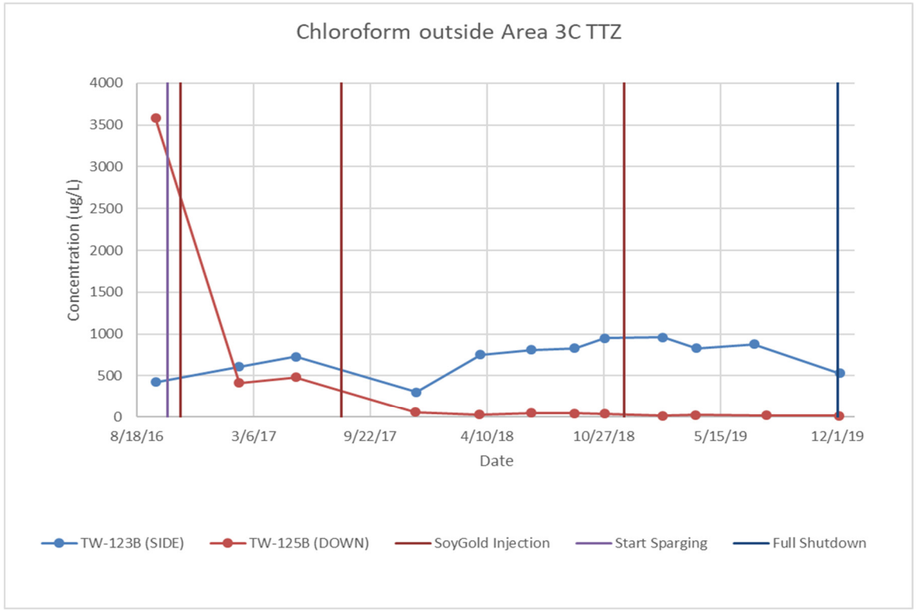


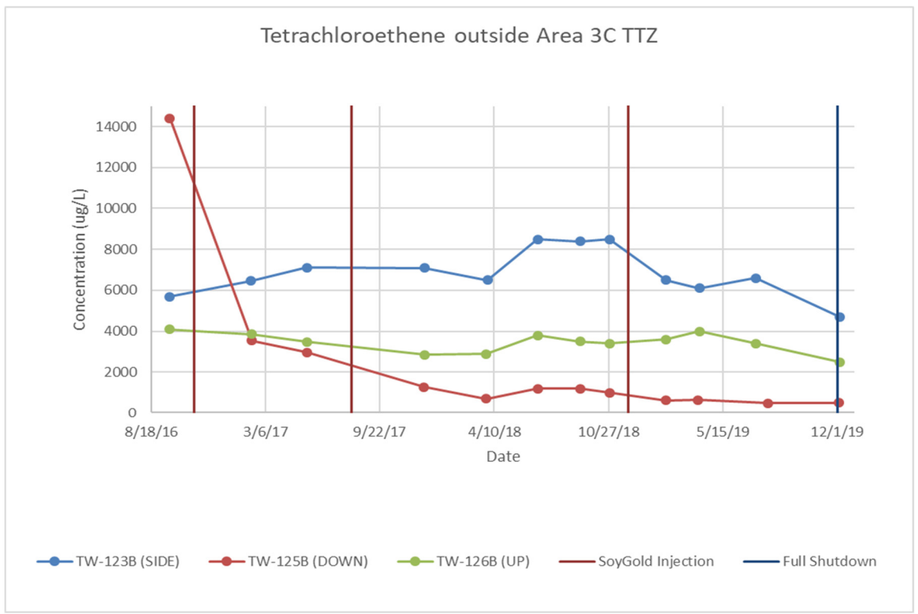


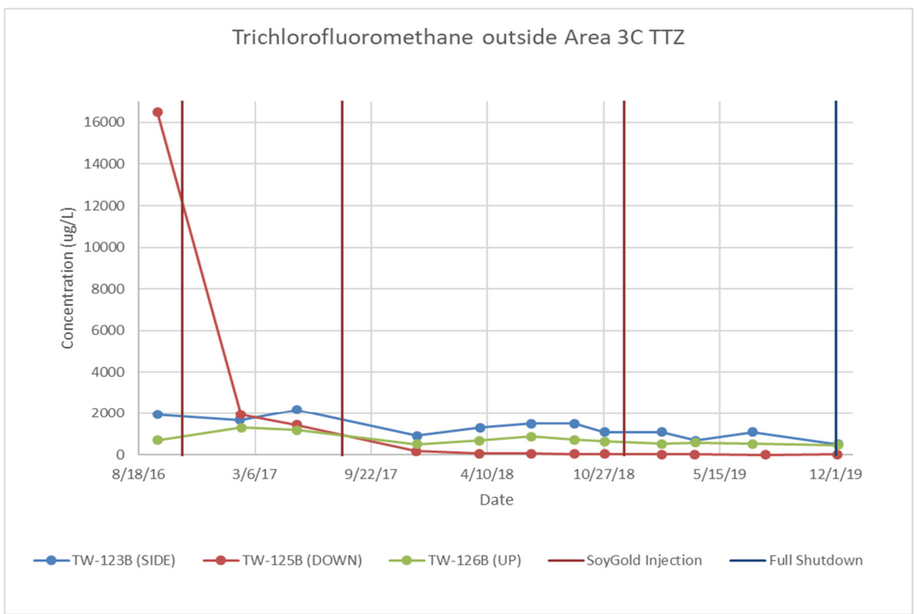
Notes: TTZ = target treatment zone

Figure 8. Trend Graphs for Constituents of Concern Inside Area 3C Target Treatment Zone
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia



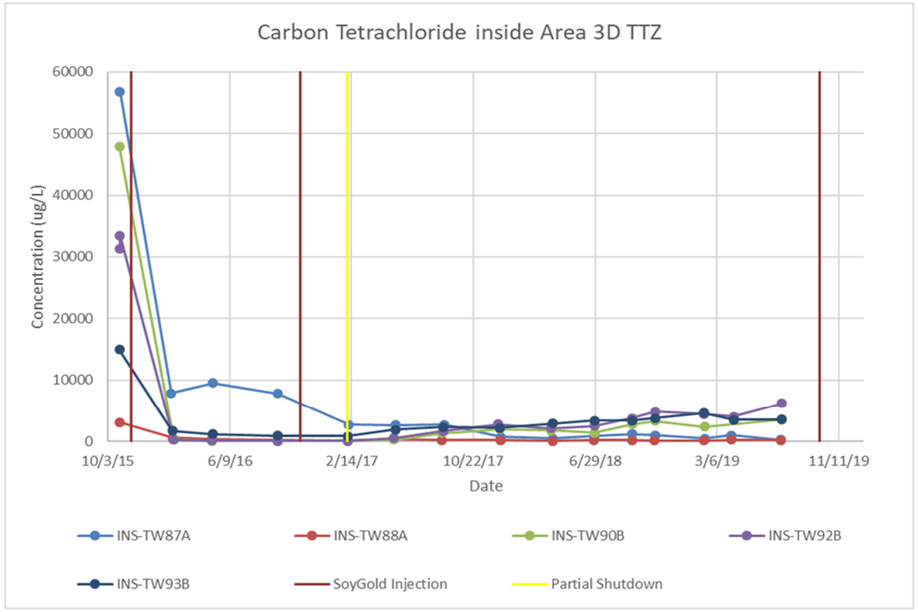


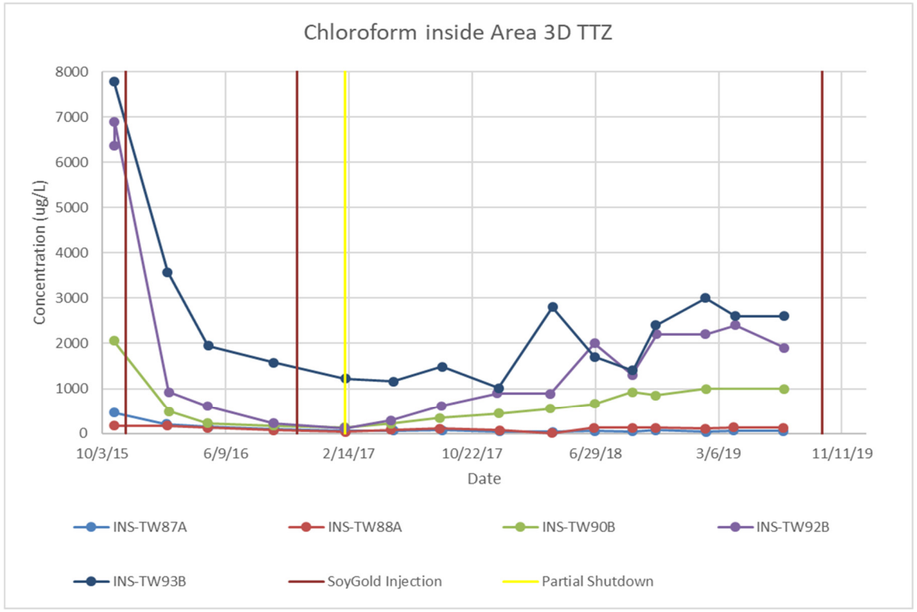


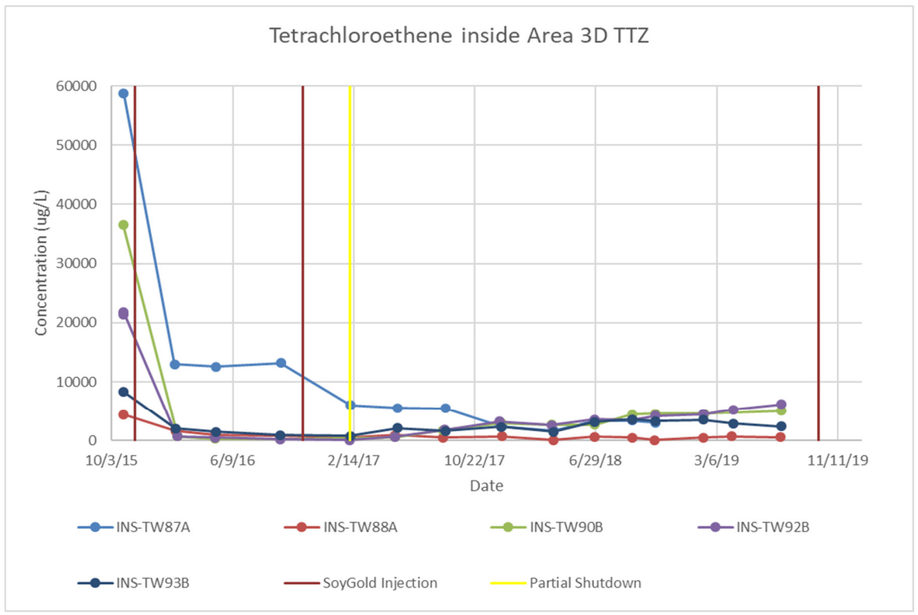


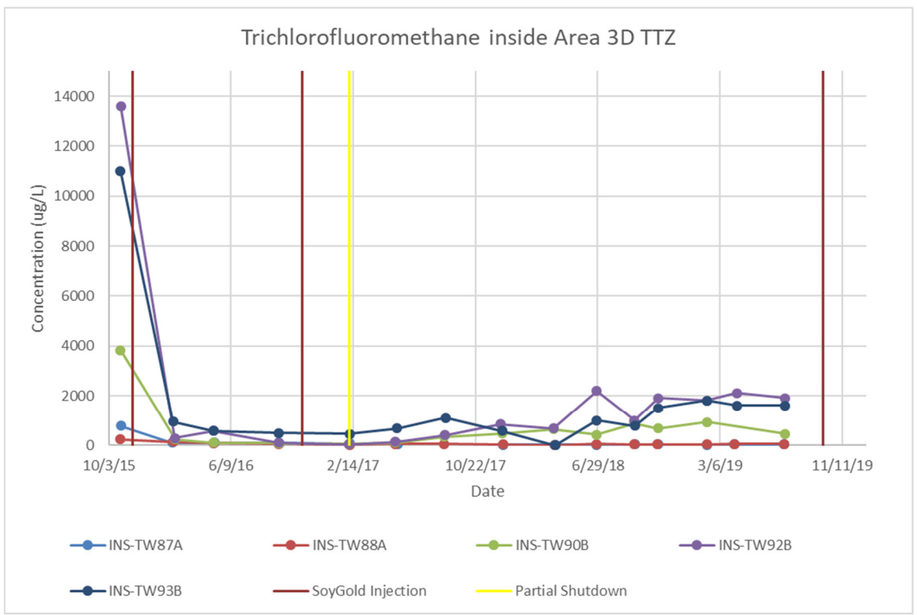
Notes: TTZ = target treatment zone
DOWN = down-gradient
SIDE = side-gradient
UP = upgradient

Figure 9. Trend Graphs for Constituents of Concern Outside Area 3C Target Treatment Zone
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia



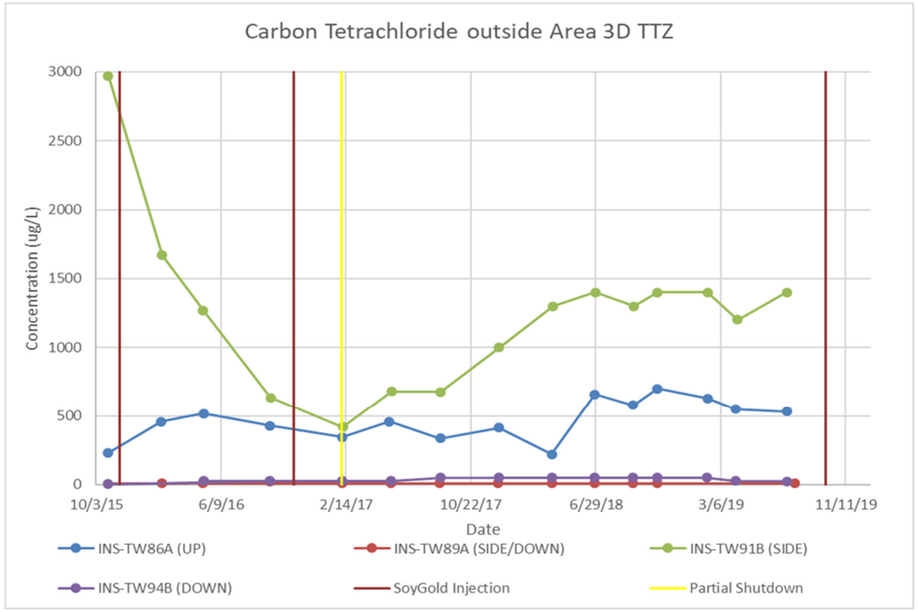


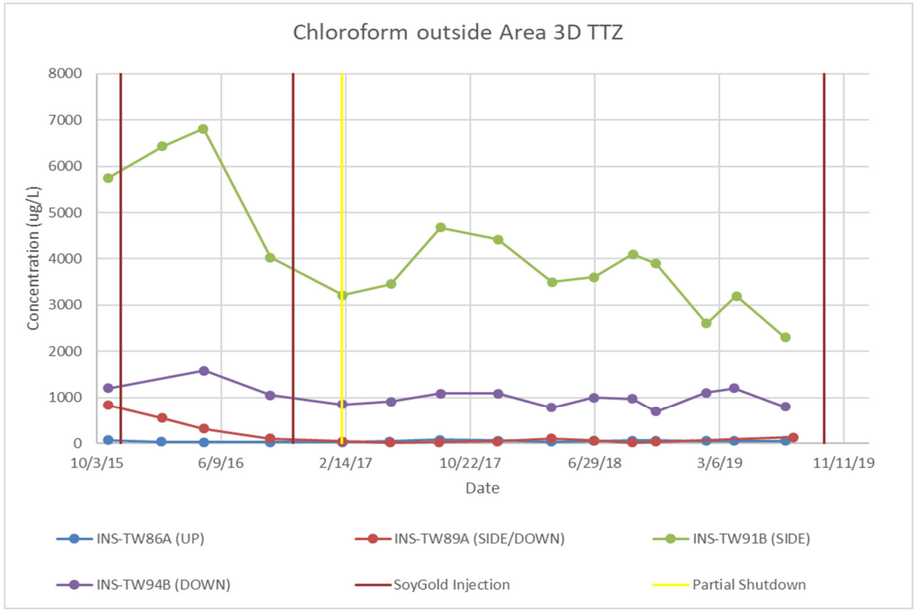


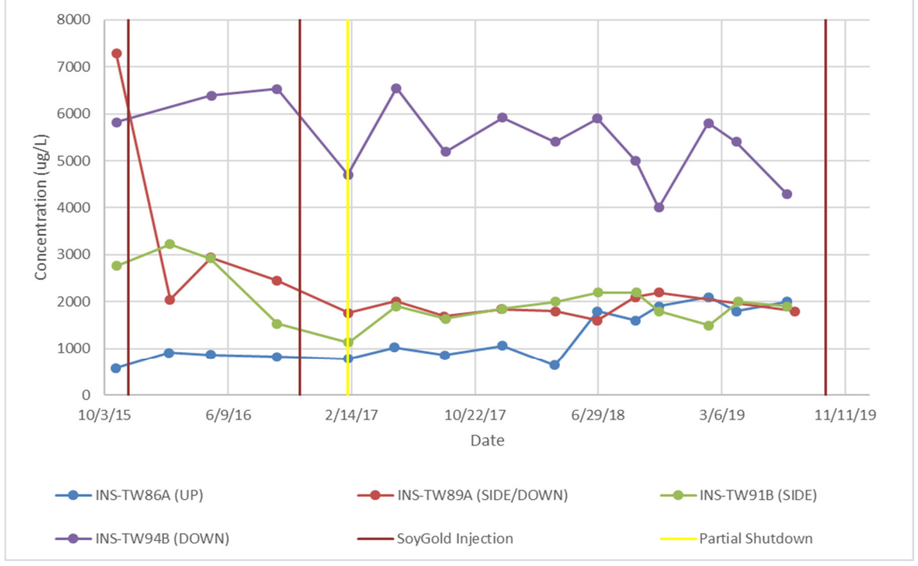


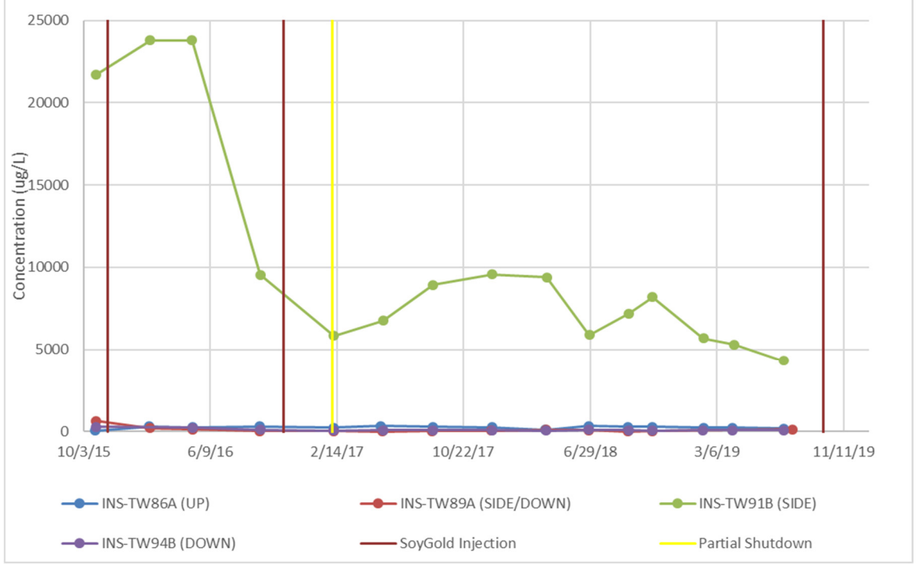
Notes: TTZ = target treatment zone

Figure 10. Trend Graphs for Constituents of Concern Inside Area 3D Target Treatment Zone
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia









Notes: TTZ = target treatment zone
DOWN = down-gradient
SIDE = side-gradient
UP = upgradient

Figure 11. Trend Graphs for Constituents of Concern Outside Area 3D Target
2019 Operation, Maintenance, and Monitoring Activities Memorandum
UCC Institute Facility, Institute, West Virginia

Appendix A
Inspections

Union Carbide Corporation (UCC) Institute Facility – Annual Inspection Checklist

Inspection Date: 12/6/2019

Inspector Name: Grant Melvin

1. Institutional Controls

The following questions will be completed after a driving and/or walking survey of the UCC Institute Facility and affected offsite properties has been completed.

1.1 UCC Institute Facility

Do West Virginia Department of Health and Human Resources records indicate potable wells have been constructed at the facility?

Yes ☐ No ☑

Is there evidence of potable water wells at the facility?

Yes ☐ No ☑

Are there new occupied structures at the facility? If so, indicate in the notes if a vapor control system was installed in the structure by properly trained and appropriately licensed personnel.

Yes ☑ No ☐ GM

Is the facility being used for nonconforming purposes (e.g., residential use)?

Yes ☐ No ☑

Is there evidence of recent earthmoving activities in the areas with subsurface work restrictions (SWMU 1, 2 & 6, 11, WWTU, and Tank 1010)? If so, determine if the subsurface work was completed in accordance with the Materials Management Plan.

Yes ☐ No ☑

Notes: ~~None~~ GM

Building 131 was expanded in 2019 and Jacobs installed a VIMS system in the expanded portion of building 131.

1.2 Offsite Affected Properties

Do West Virginia Department of Health and Human Resources records indicate potable wells have been constructed at the Appalachian Power Company or the portions of the Norfolk Southern or West Virginia properties subject to groundwater use restrictions (Figure 1-8)?

Yes ☐ No ☑ Not Applicable ☐

Is there evidence of potable water wells at the Appalachian Power Company or the portions of the Norfolk Southern or West Virginia State University properties subject to groundwater use restrictions (Figure 1-8)?

Yes ☐ No ☐ Not Applicable ☑

Are there new occupied structures at the Norfolk Southern property, or new residential occupied structures at the West Virginia State University property? If so, indicate in the notes if a vapor control system was installed in the structure by property trained and appropriately licensed personnel.

Yes ☐ No ☐ Not Applicable ☑

Is the Norfolk Southern property being used for nonconforming purposes (e.g., residential use)?

Yes ☐ No ☐ Not Applicable ☑

Notes: None

2. Sitewide Groundwater Monitoring Wells

Is there damage to the protective bollards for the wells?

Yes ☐ No ☑

Notes: _____

Are wells made visible by painting and numbering? Yes ☑ No ☐

Notes: _____

Do wells have concrete surface aprons adequate so that the well samples are not impacted by surface water?

Yes ☑ No ☐

Notes: None

Is there damage to the protective casing?

Yes ☐ No ☑

Notes:

Are wells secured by locking? Yes ☑ No ☐

Notes:

3. Corrective Actions Completed

Notes: None

JACOBS

Union Carbide Corporation Institute Facility – Quarterly Inspection Checklist

Inspection Date: 9- /24/19

Inspector Name: B. Smith

1. SWMU 1 Soil Cover

Warnings signs in place?

Yes ☑ No ☐

Gates closed and locked?

Yes ☑ No ☐

Perimeter fence intact and functioning as intended?

Yes ☑ No ☐

Evidence of subsidence or settlement?

Yes ☐ No ☑

Gravel cover in place?

Yes ☑ No ☐

Evidence of deterioration of cover?

Yes ☐ No ☑

Evidence of erosion damage?

Yes ☐ No ☑

Are there woody plants that need to be removed?

Yes ☐ No ☑

Are tar accumulations present at the ground surface near or outside the fence?

Yes ☐ No ☑

Notes: None

2. SWMU 2 & 6 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☒ No ☐

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

New growth of woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: BEGINNINGS of RAIN RUTS on WESTERN SLOPE

3. SWMU 11 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the surface drain in the southwestern corner clear of debris and functioning as intended?

Yes ☒ No ☐

Notes: ______________________________

____

4. No. 1 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Are there any deficiencies in the gravel roadway such that buried waste could be exposed?

Yes ☐ No ☒

Notes: None

5. No. 2 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap along the perimeter in place and functioning as intended? Yes ☒ No ☐

Notes:

6. No. 3 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: NONE

7. Former Biobasin No. 1 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

_____

8. Former Biobasin No. 2 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☒ No ☐

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

_____

9. Former Biobasin No. 3 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: _____

_____

10. Former Panic Pond Area Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap in the central area in place and functioning as intended?

Yes ☒ No ☐

Is there damage to the concrete or WWTU infrastructure in the western area such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

_____

11. Former Equalization Basin

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

_____

12. Former Pond Soil Cover

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: _____

_____

13. Corrective Actions Completed

Notes: _____

_____

_____

_____

_____

_____

_____

_____

JACOBS

Union Carbide Corporation Institute Facility – Quarterly Inspection Checklist

Inspection Date: 12 /26/ 19

Inspector Name: G SMITH

1. SWMU 1 Soil Cover

Warnings signs in place?

Yes ☑ No ☐

Gates closed and locked?

Yes ☑ No ☐

Perimeter fence intact and functioning as intended?

Yes ☑ No ☐

Evidence of subsidence or settlement?

Yes ☐ No ☑

Gravel cover in place?

Yes ☑ No ☐

Evidence of deterioration of cover?

Yes ☐ No ☑

Evidence of erosion damage?

Yes ☐ No ☑

Are there woody plants that need to be removed?

Yes ☐ No ☑

Are tar accumulations present at the ground surface near or outside the fence?

Yes ☐ No ☑

Notes: NONE

2. SWMU 2 & 6 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☑

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☑

Evidence of erosion damage?

Yes ☐ No ☑

Evidence of deterioration of cover?

Yes ☐ No ☑

Vegetative cover in place?

Yes ☑ No ☐

Is the grass overgrown?

Yes ☐ No ☑

New growth of woody plants that need to be removed?

Yes ☐ No ☑

Evidence of water ponding on the surface?

Yes ☐ No ☑

Notes: NONE

3. SWMU 11 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☑

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☑

Evidence of erosion damage?

Yes ☐ No ☑

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the surface drain in the southwestern corner clear of debris and functioning as intended?

Yes ☒ No ☐

Notes: NONE

---

4. No. 1 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Are there any deficiencies in the gravel roadway such that buried waste could be exposed?

Yes ☐ No ☒

Notes: NONE

5. No. 2 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap along the perimeter in place and functioning as intended? YES

Notes: NONE

6. No. 3 Sludge Pond Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: NONE

7. Former Biobasin No. 1 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: NONE

8. Former Biobasin No. 2 Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: None

9. Former Biobasin No. 3 Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Notes: None

10. Former Panic Pond Area Soil Cover

Evidence of subsidence or settlement?

Yes ☐ No ☒

Evidence of furrow, ruts, or animal burrows?

Yes ☐ No ☒

Evidence of erosion damage?

Yes ☐ No ☒

Evidence of deterioration of cover?

Yes ☐ No ☒

Vegetative cover in place?

Yes ☒ No ☐

Is the grass overgrown?

Yes ☐ No ☒

Are there woody plants that need to be removed?

Yes ☐ No ☒

Evidence of water ponding on the surface?

Yes ☐ No ☒

Is the rip rap in the central area in place and functioning as intended?

Yes ☒ No ☐

Is there damage to the concrete or WWTU infrastructure in the western area such that buried waste could be exposed?

Yes ☐ No ☒

Notes: None

11. Former Equalization Basin

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: NONE

12. Former Pond Soil Cover

Is there damage to the concrete or WWTU infrastructure such that buried waste could be exposed?

Yes ☐ No ☒

Notes: NONE

13. Corrective Actions Completed

Notes: None

Appendix B
Laboratory Report and Data Quality Evaluation Memorandum
(provided separately)

Appendix C
Mass Reduction Plots

Target Treatment Zone (TTZ) Thiessen Mass Plots